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Ex Libris
Oskar Klotz

To the Editors of the National Intelligencer.

I find the following in the Union of this morning. The subject being one of great importance, and one in which every class of society is more or less interested, I take the liberty of asking you to insert it in the Intelligencer. It is rather surprising that in this enlightened age so little attention has been paid to the appointment of Coroners. It seems to have been the impression that any one was fit to be a *coroner*. This has ceased to be the case, however, in the greater part of Europe, and the idea is gaining ground in this country that a coroner should be something more than a police magistrate or constable. I hope to see a change in the Metropolis of the Union.

MEDICAL CORONERS.—It will be remembered that the President of the Board of Health, in his last annual report, called the attention of the public to the importance of selecting coroners from the medical profession, so that all the data necessary to a correct verdict may be adduced. We find in the "Boston Medical and Surgical Journal" of May the 8th the following appropriate and striking example, taken from the London Lancet:

"MEDICAL MEN AS CORONERS.—It must be apparent that in the holding of an inquest over a dead body, medical opinion is often required. The coroner and his jury are often incompetent to decide as to the cause of death, or the manner in which it takes place. For such investigation, it requires men practically qualified—men that have made the science of anatomy and physiology their study. The mere form of filling a blank, or the questioning of witnesses, are not all the duties required of a coroner. He should ascertain, if within the bounds of human possibility, the cause of death; or, if medical men are employed to make the examination of the body, he should know that they have done their duty faithfully. It is impossible to say how many have had their deaths attributed to causes which never existed; and men have been arrested for murder or manslaughter, upon a coroner's warrant, when they were entirely innocent of the charge. A recent occurrence, which we find in the March number of the London Lancet, has a bearing in this matter. An inquest was held by the editor of the Lancet, (a medical man,) over the body of one William Vost. It appeared that he was married on the morning of the day of his death, and, when returning from the church, called [illegible] his [illegible]in-law when an altercation took place between them They were seen to fall to the ground together while struggling, and when they got up resumed the fight until separated. Mr. Vost went to his home and sat down to his bridal dinner, and two or three minutes after, on suddenly arising from the table, fell and expired before any assistance could be rendered. The son-in-law was arrested, and in the mean time the coroner had ordered a post-mortem examination to be made. The bulletin of the medical examiner was, that he had examined the body, and found all the organs healthy and in a perfectly natural condition; the brain, however, being in a remarkable state of conjestion. Had the case been given to the jury then, they in all probability would have rendered their verdict, that the said William Vost came to his death by injuries received during an affray with his son-in-law. The coroner, however, in instructing the jury, thought the man might have been choked, and ordered the surgeon to examine the threat, when, lo and behold, a piece of mutton, half as big as the hand, was found packed in the inferior part of the larynx, sufficient to cause the suffocation and death of the man!"

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Th. G. Wall

OUTLINES

OF A

COURSE OF LECTURES

ON

MEDICAL JURISPRUDENCE.

BY

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OF EDINBURGH.

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PREFACE.

OF THE

AMERICAN EDITOR.

THE first edition of the Outlines of Dr. Traill was printed from his Dissertation on Medical Jurisprudence, in the seventh edition of the Encyclopædia Britannica, for the use of his pupils, in the celebrated Medical School, of which he is one of the distinguished teachers. This edition having been exhausted, the "repeated demands for a new and enlarged edition have given rise to the present publication."

Not only does the work contain an epitome of the leading general principles of Medical jurisprudence, but also of Medical Police. It, therefore, cannot fail to be a useful manual of reference, both to the physician and the lawyer; and a valuable accompaniment to the medical student.

The American Editor has restricted himself to the correction of errors, and to the adding of such notes as appeared to him to throw additional light on the topics discussed in the text. His additions are generally in notes, and are enclosed in brackets.

Philadelphia, June 5, 1841.

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OUTLINES

OF

MEDICAL JURISPRUDENCE.

THE connection between Medicine and Legislation had been perceived long before it was considered as a peculiar branch of study, or had even obtained a distinctive appellation. Since its importance has been recognised, it is known in Germany, the country in which it took its rise, by the name of STATE MEDICINE; in Italy and in France it is termed LEGAL MEDICINE; and with us it is usually denominated MEDICAL JURISPRUDENCE or FORENSIC MEDICINE. It is founded on the relations which ought to subsist between human nature and social institutions, and consists in the application of the principles of medical science to the administration of justice, and to the preservation of the public health. Its nature and objects will be best elucidated by a sketch of its progress.

HISTORY OF LEGAL MEDICINE.

Notwithstanding the importance of the objects which it embraces, and their intimate relation to the interests of society, the true origin of Medical Jurisprudence is of comparatively recent date. It is true that traces of its principles may be perceived in very remote times. In the Mosaic institutions, the judges are enjoined to consult the *priests*, who were the sole physicians of that age and country, on the modes of distinguishing leprosy from other diseases, on the marks of defloration, and the examination of wounds. In the slight notices handed down to us of the ancient code of Egypt, attributed to Menes, we may observe one trace of the influence of medicine on legislation, in the law which forbade the infliction of corporal punishment on a pregnant female; but among the ancient states of Greece the principles of medical science, though successfully cultivated, seem scarcely to have been applied to legislation, except in certain questions respecting the legitimacy of children, a subject on which the notions even of Aristotle were not very definite. In the writings of Galen, however, we find more distinct traces of legal medicine; as in his various remarks on the difference between the lungs of a fœtus and of an adult, in his treatise on simulated diseases, and in his observations on the legitimacy of seven-months children.

The laws of ancient Rome were borrowed from Greece, and we could scarcely expect to find in them a more refined legislation; but it is worthy of notice that the laws of the Twelve Tables fix on 300 days as the extreme duration of utero-gestation, the precise term fixed by the Code-Napoleon. Some writers contend, that the Roman law authorized the inspection of dead bodies by medical men, because of the twenty-three wounds by which Cæsar fell, the physician Antistius pronounced one only mortal; and because Tacitus has spoken of the marks of poison on the bodies of Germanicus and Agricola: yet we have no proof that such opinions were required by any positive law, or that the judge was in the habit of demanding the assistance of the physician. In the Justinian code, however, we find more obvious traces of the relation between medicine and law; as in the titles "De statu Hominum;" "De Pœnis et Manumissis;" "De Sicariis;" "De Inspiciendo ventre Custodiendoque partu;" "De Muliere quæ peperit undecimo mense;" "De Impotentiâ;" "De Hermaphroditis;" yet in the Justinian code it was not by the testimony of living medical witnesses that such questions were to be decided, "but on the authority of the learned Hippocrates."

It was chiefly on questions of medical police, as to what regarded the salubrity of cities and stations, that the ancient Greek or Roman magistrates had recourse to medical assistance; and it appears that it was to such subjects that the public functions of the *Archiater* of the lower empire were confined.

Medical Jurisprudence, as a science, cannot date farther back than the 16th century. Various German emperors had in vain attempted the introduction of a uniform criminal code; but George, bishop of Bamberg, in 1507, proclaimed a penal code, drawn up for his states by Baron Schwartzemberg, in which the necessity of medical evidence, in certain cases, was recognised: and though this improvement was for some time resisted by the greatest part of Germany, the Emperor Charles V. eventually succeeded in persuading the diet of Ratisbon, in 1532, to adopt a uniform code of German penal jurisprudence, founded on that of Bamberg, in which the civil magistrate was, in all cases of doubt or difficulty, enjoined to obtain the evidence of medical witnesses; as in cases of personal injuries, infanticide, murders by poison or other means, pretended pregnancy, simulated diseases, &c. The celebrated "Constitutio Criminalis Carolina" was published in 1553: this must be considered as the true dawn of Legal Medicine, and Germany the country which gave it birth. To the same country must be ascribed the glory of having first thrown the shield of medical science over the victims of a dark fanaticism. The belief in the powers of witches and sorcerers was in full force in the 16th century. It is computed that in Lorrain above 9000 persons were burnt alive within nineteen years for the imputed crime of sorcery; and that in the Electorate of Treves alone, within a few years, 6500 individuals had perished in the flames for the same imaginary crime. In Germany and France, instances of pretended demoniacal possession were perpetually occurring; and at Freidberg public prayers were offered up to assuage that dire affliction. Weiher, physician to William, Duke of Cleves, had the boldness to impugn these superstitious notions in a tract published at Basle in 1564, and undertook to prove that witches and demoniacs ought to be considered as unhappy persons subject to hypochondriasis and hysteria, whose maladies should rather excite pity, than render them obnoxious to punishment; while he ridiculed the ordinary modes by which these unfortunate beings were proved to be guilty of the alleged crimes. This attack on a popular superstition aroused alike indignation and vengeance against the daring innovator; and, but for the powerful intercession of his patron, Weiher would have perished in the flames from which he had tried to save others.

In the close of that century many treatises on different branches of Legal Medicine appeared in various countries. Ambrose Paré wrote "On Monstrous Births," "On Simulated Diseases," and a memoir "On the art of drawing up Medical Reports." In 1598, Severin Pineau published at Paris the treatise "De Notis Integritatis et Corruptionis Virginum;" a book still quoted as an authority. The first *system of Legal Medicine* appeared about the same time in Sicily, in the work of Fortunato Fidele, "De Relationibus Medicorum;" in which, as might be expected in his age and country, the opinions of the physician are too much warped by his servile deference for the canon law and its clerical expounders.

The rapid progress of anatomy in the commencement of the 17th century now became apparent in the invaluable "Quæstiones Medico-Legales" of Paulo Zacchia, which appeared in successive volumes from 1621 to 1635, a work which will ever be regarded as a land-mark in the history of Legal Medicine; and which, by its learning and its sagacious indications, in an age in which chemistry was in its infancy, and physiology very imperfect, places the medical acumen of the great Roman medico-jurist in a very favourable point of view.

The noble discovery of the circulation of the blood gave a new light to physiological reasoning, which was broadly reflected on Legal Medicine; and to Harvey we also owe the idea how the application of Galen's remark, respecting the difference between the adult and the fœtal lungs, might be applied to elucidate cases of infanticide.

About the same time appeared two valuable treatises by Melchior Sebiz, "De Notis Virginitatis," and "Examen Vulnerum." In the first, he maintained that the existence of the hymen was the real mark of virgin purity; an inference warmly denied by Orazio Augenio and Pietro Gassendi: in the second he pointed out the importance of distinguishing between wounds *incidentally* and *necessarily* fatal.

In 1663, Thomas Bartholin, a Danish physician, carefully investigated the period of human utero-gestation, and proposed the *Hydrostatic Test,* or observing whether the lungs of the infant floated or sank in water, as proving whether it had ever breathed. The rationale of this process was more fully explained by Swammerdam in 1677; but was first applied to practical use by Jan Schreyer in 1682; after having been investigated by Thruston and Rayger.

While these important steps were in progress, Germany set the example of the first public prelections on Medical Jurisprudence. About the middle of the 17th century, Michaelis gave the first course in the University of Leipzig: these were soon followed by the lectures of the celebrated Bohn, who, before the close of the century, had published his valuable works "De Renunciatione Vulnerum," and "Dissertationes Medicinæ Forensis," which were speedily succeeded by the tract "De Officiis Medici Duplici, Clinici et Forensis." The first two were nearly contemporary with the investigations of Welsch and Amman "On the Fatality of Wounds," and the celebrated work of Licetus, "De Monstris;" and the latter with the valuable "Sepulchretum" of Bonnet.

The mode of conducting medico-legal investigations had attracted attention in France, from the time of Ambrose Paré, through the 17th century. French authors love to trace the rudiments of the science in their country from the 12th century, in the rules given in the "Assizes of Jerusalem," for drawing up exemptions from certain civil and military duties, and in several subsequent ordonnances of their monarchs, for the inspection of wounds: enactments from which we may trace the nstitution of the *Chirurgiens du Châtelet.* In 1603, Henri IV. authorized his physician to appoint persons, skilled in medicine and surgery, to make judicial inspections and reports in all cities and royal jurisdictions. The difficulty of carrying this into effect induced Louis XIV. to create, in 1692, *hereditary royal physicians and surgeons,* for the same purpose, with various immunities and privileges; but their corruption and venality soon became notorious; yet the office was not suppressed until 1790.

Various decrees, however, of the Parliament of Paris, from the middle to the end of the 17th century, were directed to the improvement of legal medicine; and that body acquired great celebrity by the general equity and good sense of its judgments. Notwithstanding this auspicious commencement, Legal Medicine did not then flourish in France; and the work of Gendry, "Sur les Moyens de bien rapporter à Justice," shows how imperfect were the then approved modes of investigation; though it proves that the importance of the subject began to be acknowledged. No other French work on Legal Medicine appeared in that century, with the exception of "Doctrine des rapports en Chirurgie" of Blégny, which was superseded in the beginning of the succeeding century by the more useful "L'art de faire des rapports en Chirurgie" of Devaux.

The 18th century commenced with happier auspices for our science, and the press teemed with important works on Legal Medicine. As early as 1700, the admirable treatise on the diseases of artificers by Bernardino Ramazzini appeared at Padua. In the following year Valentini published his "Pandectæ Medico-legales;" his "Novellæ" appeared in 1711; and both were incorporated in the excellent "Corpus Juris Medico-legale" in 1722. This work contains a judicious view of all that had been done before him, and is a vast store-house of medico-legal information.

Several professorships for teaching this subject were about that period founded in the German universities; and the succession of German writers becomes now so numerous, that we cannot attempt to give a catalogue, far less to characterize their works. Zittman, Boerner, Kannegeiser, and Teichmeyer, each published systems of various yet acknowledged merit. The "Institutiones Medicinæ Legalis" of the latter long formed the manual of the student: the clear and forcible reasoning of Storch in his work ["De Medicinæ Utilitate in Jurisprudentia," (1730,) vindicated the high importance of this branch of knowledge: but the "Systema" of Alberti, Professor of Legal Medicine at Halle, in six quarto volumes, was the most complete and laborious work that had been published on this subject. The writings of this learned man are obscured by his attachment to the mysticism of the Stahlian school; yet the industry with which he has collected facts, renders his work a precious mine of information. Curious additions to our knowledge were made by the smaller publications of Loewe, Richter, Budæus, Troppanneger, Fritch, and Wolff, Hermann, Clauder, Herzog, and Parmeon; which are chiefly valuable to those who may be called on to exercise the profession in Germany. In the "Bibliothèque Médicale" of Ploucquet will be found the names of those who have dedicated themselves to the illustration of particular branches of this extensive subject; and the "Collectio Opusculorum" of Schlegel contains some of the best detached treatises of the first three-fourths of the last century, on the subject of wounds, poisoning, infanticide, utero-gestation, insanity, and the legal inspection of dead bodies. About the same time appeared the "Anthropologia Forensis" of Hebenstreit, the "Specimina" of Fursteneau, the "Institutiones" of Ludwig, and the "Elementa" of Fazelius. The lectures of Haller belong to this same period, though they were not published till 1781—2. Towards the close of the last century the Germans were almost the only successful cultivators of Medical Jurisprudence. The "Elementa" of Plenck appeared in 1781, and the book is still considered a good introduction to the study. The "Bibliothek" of Daniel appeared in 1784; and in it we find the name of *state medicine* given to this branch of knowledge. Between 1790 and 1800, appeared the "Conspectus" of Sikora, the "Handbuch" of Loder, the "System" of Metzger, and the "Entwurf" of Müller.

During the last century little was done in Italy after the time of Ramazzini; and in France the subject had attracted little attention until the celebrated case of *Villeblanche* called forth the memoir of Louis on the period of utero-gestation, in which he attacked the pretended instances of protracted pregnancy with powerful arguments, which were seconded by Astruc and Bouvart, but vehemently opposed by Le Bas and Antoine Petit. This controversy gave rise to many able publications, in which Pouteau and Vogel took part; but victory remained with Louis and his adherents.

Louis also wrote a valuable memoir on the anatomical examination of bodies found hanged; he pointed out the mode by which we are able to distinguish assassination from suicide in such circumstances. He applied them to the celebrated cases of *Calas,* of *Syrven, Montbaillet,* and *Baronet,* which are models of medico-legal investigation; and he may be considered as the first who publicly taught in France the just application of medical knowledge to jurisprudence.

The subject of poisoning was examined by Sallin, in a case where a person had been buried sixty-seven days; and he made a very ingenious attempt to investigate the effects of poisons; but has sometimes substituted speculation for facts.

In 1789, Professor Chaussier read his excellent "Mémoire" before the Academy of Dijon; in which he showed the necessity of careful inspection by the medical witness in all cases of death from blows or wounds, and gave admirable models of medico-legal reports. It was published in 1790, in which year he delivered a course of lectures on Legal Medicine to numerous pupils. The last year but one of the last century gave to the world the very excellent "Traité de Médecine Legale" of Foderé.

It may excite surprise that in this sketch we have yet made no mention of British authors. The fact is, that with the exception of the short "Elements of Medical Jurisprudence," published by Dr. Samuel Farr in 1788, which is little else than an abridgement of Fazelius, there was no general treatise on Forensic Medicine in the English language before the beginning of this century.

It is true that some medico-legal questions are ably, but incidentally, treated in the writings of Mead, Monro, Denman, Percival, and John Hunter, and that an interesting Essay was published by Dr. Wm. Hunter "On the uncertainty of the signs of murder in the case of bastard children;" but the importance of the study, as a whole, was not understood in this country till long after the publication of many valuable systems in Germany, Italy, and France.

In the present century France took the lead. The end of the last century was marked by the institution of three professorships of Forensic Medicine. Mahon was the first French professor, and his reputation as a teacher gave him a name, which the posthumous publication of his lectures has not sustained. The useful "Cours de Médecine Legale" of Belloc, appeared in 1810. Tartra's excellent "Traité de l'Empoisonnement par Acide Nitrique," was published in the same year; between which and the year 1801, various short treatises appeared, chiefly on detached branches, by Achart, Druard, Navort, Masson, Faulaure, Desortieux, Vigné, Lamarre, Banc-Cavé, Godemar, Rafenaut, De Lisle, and Faure.

In 1814, appeared the important "Toxicologie" of Orfila (a Spaniard naturalized in France,) which has changed the face of this part of Medical Jurisprudence, by the number of experiments, the original views on the nature and action of poisons, and the disquisitions on the modes of detecting them, which it contains. The French practitioner may consult with advantage the "Manuel" of Bertrand, published in 1817; and the admirable "La Médecine Legale relative à l'Art des Accouchemens" of Capuron, has scarcely left us any thing to desire on this branch of the subject. In 1819 appeared the excellent Essays of Lecieux on "Infanticide," of Renard on "Medico-legal examinations of dead bodies," of Laisné on "Perforations of the Stomach," and of Rieux on "Ecchymosis, Sugillation and Contusion," in the same volume. Chaussier published his valuable "Recueil de Mémoires, Consultations, et Rapports," in 1824; and a new edition appeared in 1838. The work of Trebuchet, entitled "Jurisprudence de la Médecine, de la Chirurgie, et de la Pharmacie," which is especially useful to the French practitioner, was published in 1834. Valuable detached essays by Federé, and Marc are contained in the "Dictionnaire des Sciences Médicales:" and we may close our French list with the "Manuel" of Briand and Brosson, republished in 1828; the "Secours à donner aux Asphyxiées" of Orfila, which appeared in 1833; and the useful "Manuel Complet" of Sedillot. A new edition of Orfila's "Toxicologie," appeared in 1836, and, among various additions, it has an important supplementary volume on "Judicial Exhumations." In the same year Devergie published his useful "Médecine Legale," in two volumes, in which the sections on asphyxia are particularly interesting, and his mode of detecting some poisons very ingenious. The important French periodical "Annales d'Hygiène Publique," has, since 1829, contributed most valuable essays on this branch of medical science, and now extends to twenty-four volumes.

We must not here omit the posthumous publication of the writings of Parent du Chatelet in 1836; his different communications to the "Annales d'Hygiène," were then collected into two volumes. His philosophic work, "Sur la Prostitution dans la Ville de Paris," also then appeared in two volumes; of this last a second edition was printed in 1837. The curious work of Fregier, "Sur les Classes Dangereuses de la Population," published in 1839, in two volumes, affords an interesting addition to medical police. The admirable essay by Pinel, "Sur Alienation Mentale," has gone through several additions since its first appearance in 1805. The comprehensive treatise "Des Maladies Mentales," by Esquirol, published at Paris in 1838, contains a very excellent account of insanity in its medical and medico-legal relations.

During the present century Germany has not been idle. We have good compends by Schmidmüller, Masius, and Willberg. Rose published a very valuable essay on "Medico-legal Dissection," which has been translated and enlarged by Marc;* and an excellent treatise on "Pharmaco-chemico-Medical Police," was given to the world by Remer. This last treatise has been translated into French by Lagrange and Vogel, in 1816. Among many works which have appeared in Germany of later years, connected with our subject, we may mention the curious collection of cases by Von Feuerbach, published in 1828, entitled "Merkwürdiger Verbrechen"—"Remarkable Crimes;" the little tract of Drs. Bunson and Berthold, on the power of "Hydrated Peroxide of iron as an antidote for Arsenic," which appeared at Göttingen in 1834; the "Contributions to Legal Medicine" of Bernt; and the masterly analysis of various poisons, by Buchner and Herberger.

Only two Medico-legal works of any consequence have proceeded from the press of Italy within the present century; the "Instituzione di Medicina Legale," by Tortosa of Vicenza, and the "Medicina Legale" of Barzellotti.

Medical Jurisprudence may fairly be said to have only commenced in Britain within the present century. The first lectures ever delivered in Britain were given in the University of Edinburgh, in 1801, by the elder Dr. Duncan; and the first established Professorship was conferred by Government on his son in 1803, since which period it has been regularly taught in this seminary.

The first original British work on Medical Jurisprudence was Dr. Male's "Epitome of Juridical or Forensic Medicine, for the use of Medical Men, Coroners, and Barristers," which appeared in 1816; and, though a short sketch, it contains interesting notices of English cases, and English law. "Medical Jurisprudence, as it relates to Insanity, according to the Law of England," was published in 1818, by Dr. Haslam, in a little volume, illustrated by original cases. But the most valuable work then presented to the public, in an English dress, was the "Principles of Forensic Medicine" of Dr. Gordon Smith, a volume commendable as an elementary treatise, less diffuse than most of the continental systems, and interesting to the British practitioner, by the numerous references to British cases, and to our national codes. In 1820, Dr. William Hutchinson published his useful dissertation "On Infanticide," in which its relation to physiology and jurisprudence is very ably considered. These works were soon followed by the more costly publication of Paris and Fonblanque, in three octavo volumes; in which, among some matter little interesting to the general student, are important references to English Jurisprudence.*

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* Paris, 1808.

The admirable "Toxicology" of Professor Christison appeared first in 1829, and has since gone through a second and and a third edition; a work the most philosophical and perfect which has yet appeared on the subject of poisons.†

Besides the well-known work of Crichton on mental derangement, published in two volumes in 1798, three very valuable works on insanity have since appeared in our language; Burrows' "Inquiry relative to Insanity;"‡ Dr. J. Conolly's "Inquiry concerning the indications of Insanity;"§ Dr. Js. C. Prichard's "Treatise on insanity;"|| which are well worthy of perusal. In 1837, Mr. Watson of Edinburgh published a very useful volume on "Homicide by External Violence," chiefly drawn from his notes on cases which he had judiciously examined.

It would be improper to pass over the labours of our trans-Atlantic brethren in this branch of science. In 1819, Dr. Cooper of Philadelphia republished in America the treatises of Farr, Male, and Haslam, with *the remarks* of Mr. Dease, intended for the information of juries and young surgeons; a letter originally addressed "to the Chief Justice of Ireland, by a surgeon of that country." Dr. Cooper added some notes, and a good digest of the laws relating to insanity and nuisance, for which his former station as a judge in the American courts well qualified him. Four years afterwards, the American press presented us with the excellent work of Dr. Beck, which is a compend of all known on the subject. The author has freely availed himself of the writings of his predecessors, in many instances of their expressions and trains of reasoning; but his references to original authorities are copious and correct; and we must consider the last edition, recently brought to this country, as the best work, on the general subject, which has appeared in the English language.*

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* [The author has omitted to notice the first part of the work of Mr. Chitty, which was reprinted in this country with notes; Philad. 1835; and also the work of Ryan, reprinted here with notes, by Dr. R. E. Griffith, Philad. 1832.]

[† This work was condensed with notes and additions, by Professor Ducatel, of Baltimore, and published under the title of a Manual of Toxicology, Baltimore, 1833.]

† Lond. 1820, 8vo. § Lond. 1830, 8vo. || Lond. 1835, 8vo.

Besides the works more strictly devoted to Legal Medicine, the student may consult with advantage the following, which abound with interesting information:—"Les Causes Célèbres et Intéressantes, par Gayot de Pitaval," in twenty-two volumes, and the continuation; "Howell's State Trials," from the reign of Henry II. to George III., in thirty-three volumes; Sir George Mackenzie "On the Laws and Customs of Scotland in Criminal matters," Edinburgh, 1699, folio; Blackstone's "Commentaries on the Laws of England;" Arnot's "Criminal Trials," Edinburgh, 1785, 4to; Baron Hume "On the Criminal Law of Scotland," two vols. 4to, Edinburgh, 1797, of which a new edition appeared in 1819; J. Burnett's work on the same subject in a quarto volume, which appeared in 1811, under the title of "A Treatise on various branches of the Criminal Law of Scotland;" A. Alison's "Principles of the Criminal Law of Scotland," an 8vo, published in 1832; Pitcairn's "Criminal Trials in Scotland, from 1488 to 1624," four vols. 4to, Edinburgh, 1833.

Medical Jurisprudence may be divided into two great branches, *Forensic Medicine,* and *Medical Police.* The first may be conveniently subdivided into, 1st, Questions, affecting the civil rights or social duties of individuals; 2dly, Injuries to property; 3dly, Injuries to the person. The second part may also be subdivided into, 1st, Questions affecting the preservation of individuals; 2dly, What relates to the health of men collected into communities.

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* [Dr. Ray has published at Boston a Treatise on the Medical Jurisprudence of Insanity, which has been much referred to.]

PART I.

FORENSIC MEDICINE.

SECTION I.—QUESTIONS AFFECTING THE CIVIL OR SOCIAL RIGHTS OF INDIVIDUALS.

I. Development of the Human Frame.—A knowledge of the usual development of the corporeal and mental powers becomes of high importance in establishing personal identity, in determining criminal responsibility, and in deciding on the validity of various civil contracts.

1. *Infancy* is the period from birth until the completion of the seventh year; and its progress is best determined by attention to the size of the body, the evolution of its proportions, and the state of the first teeth. The average weight of an infant, at full maturity, may be estimated at 7 lb. avoirdupois; but children have grown up whose weight at birth did not equal 3 lb. I once weighed a child at the moment of birth that weighed 14 lb., and Mr. Park of Liverpool found another to be 15 lb. The length of a mature infant varies from 16 to 22 inches. The period of dentition is also variable. Some get their first teeth at five or six months, others not until after the first year. Healthy chidren attempt to walk and speak soon after the end of the first year, others are somewhat later; but, in general, children can walk before they can articulate, and girls generally learn to speak at an earlier age than boys. The first set of teeth, twenty in number, are usually complete at the end of two years,

and they remain through the period of infancy. Its conclusion is marked by the loss of the milk incisors, and the coming of the first permanent teeth.

2. *Childhood* may be considered as extending from the last period to the fourteenth or fifteenth year, or the commencement of puberty. The principal increment in stature is attained during this period, the intellect is considerably developed, and the girl now appears to be one or two years more advanced in her perceptions and ideas than the male child. The expansion of the body, the state of the teeth, and of the genitals, afford its principal characteristics.

3. *Adolescence* is marked by changes in the whole constitution, by the commencement of the beard in males, and of the catamenia in females: this period is of uncertain duration, but may be considered, with us, as extending to the seventeenth or eighteenth year. Instances, however, occur of precocious puberty in either sex; like the case of *Philip Howarth,* detailed in the Medico-Chirurgical Transactions, vol. i.; or of the boy who was exhibited to the German *Naturforscher* in 1830, at Hamburg. In both, all the ordinary marks of virility appeared at four years of age; and Dr. Münchmeyer of Luneburg, on the same occasion, gave an instance of a female in whom the marks of womanhood had been observed at the age of three years.*

4. *Youth*† is the period between adolescence and the full perfection of the bodily powers. In it the generative function is perfected. We may consider it as terminating with the age of legal majority, though probably it should be extended to the twenty-fifth year, as it is with some nations.

5. *Virility* is that period during which all the bodily powers are perfect, and the mental faculties are matured. It has no definite bounds in man; but the perfection of the bodily powers of the female may be considered as bounded by the period when the catamenia cease, or when a woman is incapable of being

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* Oken's Isis, 1830.

† [The division of youth appears to be unnecessary. The period of adolescence may properly comprise that which is assigned to youth by the author.]

a mother; which usually takes place about her forty-fifth year. It is during this period that all the bodily and mental faculties have generally acquired their full perfection in both sexes.

6. *Old Age* has no absolute beginning, fixed by nature, except in what we have just noticed of the female. It is exceedingly difficult to ascertain the age of persons of either sex in this period of life, so that no general rule can be fixed, and the limits of old age on either hand cannot be determined. Its general characteristics are stiffness of the limbs, wrinkling of the skin, loss of teeth, blanching of the hair, impaired vision, and decay of all the bodily faculties. Its approaches are often marked by the appearance of fan-like wrinkles at the outer canthus of the eye, by increased obesity, and by the shoulders becoming round.

7. *Decrepitude* is the last stage in human existence, in which the bodily vigour is decayed; the knees and spine are curved, from the inability of the muscles to support the weight of the superior parts of the body, or by alterations in the form of the cartilages; the senses are blunted; and the only refuge is the grave.

The periods, at which these various changes take place, are accelerated and retarded by constitution, climate, food, habits, education, and occupation.

The influence of natural vigour of constitution, in promoting the approach of puberty, or retarding decay, is too obvious to require illustration.

The effects of climate in promoting or retarding puberty have been generally admitted. Females in the Torrid Zone have been stated to become mothers more early than with us. Foderé instances the difference in this respect between the inhabitants of the warm, maritime part of Provence, and of the elevated valleys of Entraunes and St. Etienne; and I remarked a similar difference in Spain, between the children in the plains of Andalusia and among the mountains of Cataluña. But wherever the human frame is prematurely developed, it is also liable to premature decay.

The well-fed children of the wealthy generally arrive at maturity before those of very poor parents, whose means of subsistence is scanty; but this is, perhaps, a less powerful modifying circumstance than the influence of constitution and climate.

Habits, education, and occupation, exercise considerable effects on the several stages of human existence. Hard labour, early rising, full mental and bodily exertion, tend to prevent precocious puberty in either case; while indolent voluptuous habits hasten its approach. A well regulated education, a modest conversation and deportment, prevent too early development, and exercise an important influence on the *moral* health of youth, and fit it for respectable and honoured age.

Such occupations as crowd children of both sexes in warm rooms seem to have some influence in early developing the signs of puberty; but it is difficult, in such assemblages, to distinguish the effects of occupation from those of several other more important circumstances. It may, however, be stated, that the young in towns generally exhibit marks of puberty earlier than the children of country labourers, especially if much exposed to the weather. Exercise is favourable to health; but severe labour is hostile to longevity, and very often hastens the approach of premature old age.

II. Duration of Human Life.—The ordinary duration of human life has, occasionally, been greatly exceeded. There are numerous instances of persons living for upwards of one hundred years, and a few have preserved their mental and bodily faculties beyond that period. Mrs. Butler lately died here at the age of 108 years; John Taylor, of Leadhills, died in 1770, at 133; Catharine, Countess of Desmond, was at court in the reign of Edward IV., and came to London in that of James I., when she was 140 years of age; Thomas Parr died in 1635, upwards of 152: Henry Jenkins died in 1670, aged 169; Jan Rovine and his wife were living in 1725, in Transylvania, at the age of 164; and Petrarsch Zortan, in the same country, died in 1724, when 185 years old.*. These are exceptions to the law which has considered the usual limit of human life as threescore and ten years.

The ordinary *Chances* of human life are an important subject of inquiry, deduced from accurate comparisons of registers of births and deaths. On this are founded the system of annuities, the principles of benefit societies, and of insurances on lives. Unfortunately these registers have been so ill kept in Britain, that our own *tables* have generally been calculated from foreign registers, especially those of Sweden and Finland. It is well known that Dr. Price's calculations, from the Northampton tables, gave far too high a rate of mortality; and have caused much loss to the nation, in the payment of public annuitants. The later tables, calculated from the last Swedish and Carlisle registers, have proved this most decisively; and the labours of Messrs. Milne, Lyon, and Finlaison have since furnished us with surer data for our calculations of probabilities of survivorship, and the payments of benefit clubs. The important questions connected with this subject, and the light which a better system of registration is capable of throwing on many subjects connected with population, and the progress of medical knowledge, the important civil rights of individuals involved in the accuracy of registers of births, marriages, and deaths, should induce the government to take up the whole question of registration, and place it on a public and permanent footing.

The earliest tables made no difference in the rate of mortality between males and females; but later investigations have satisfactorily proved, that in every country, the chances of female life are superior to those of male life. The average shows this superiority to amount to between three and four years; and at no period are they nearly equal, except between the age of twenty-five and thirty-five when the number of accouchements are the most numerous. Even from birth to the fifth year, the female chance of survivorship is to the male as 1.18 to 1; and there are even more still-born males than females, as 3 to 2.

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* Pennant's Tour in Scotland; Sinclair on Longevity.

There is always found an excess of male over female births, in every country where registers are kept, and this preponderance is necessary to preserve a balance between the relative numbers of sexes, as males are more subject to casualties than females. In Germany the male births exceed the female as 20 to 19; in France they are 18 to 17; in Dr. Cleland's tables for Glasgow they are stated as 19 to 18.*

In great cities the mortality is greater than in the country, especially in the early periods of life; but, it is worthy of notice, that in Vienna, Paris, London, Glasgow, and other great cities, the proportion of persons living beyond the age of sixty is greater than in most country parishes.†

The periods of greatest mortality in cities are the months of February, April, and May, in European climates; though the greater number of the sick are found in the autumnal months.‡

* [In Philadelphia, the proportion from 1821 to 1830 was as 21 to 19.43. It does not appear to the annotator that the author's reason for the preponderance is the correct one. The statistical investigations of Quetelet* led him to infer, that during the early stages of life, there are agencies operating to reduce the proportion of the male sex; and those of Dr. Gouverneur Emerson† show clearly that the greater liability of males to accidents does not furnish a sufficient reason for their greater mortality; the deaths reported in the Philadelphia bills, under the head of casualties, constituting a small proportion of the whole mortality; and this proportion, when burns and scalds are included, being more considerable in the case of the female. Dr. Emerson found the gross male mortality under the twentieth year, for the three years which he took for his observations, to exceed the female in the ratio of 7.94 per cent.]

† [It is also worthy of remark, that in some of the most insalubrious situations, the longevity of the inhabitants is remarkable. See Dunglison's Elements of Hygiene, p. 135. Philad. 1835.]

‡ [During a period of twenty years, the deaths in Philadelphia, amongst adults and children, were as follows:—

	Adults.	Children.
March, April and May,	7.229	5.264
June, July and August,	7.606	9.462
September, October and November,	7.545	6.369
December, January and February,	6.909	5.153‡

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* Sur l'Homme, 1, 156, Paris, 1835.

† Amer. Journal of the Medical Sciences, Nov. 1835.

‡ [Dr. Emerson, in Amer. Journ. of Med. Sciences, Nov. 1827, and Nov. 1831.]

On the other hand, the season of greatest sickness and mortality in the country is in the months of August, September, and October.

Recent investigations show a considerable diminution of mortality in most of our large towns, though certain classes of diseases have increased with our wealth, and the increase of sedentary occupations. Heberden, Willan, and Bateman, have shown that phthisis, apoplexy, and other sudden deaths are now more frequent than formerly.*

III. Personal Identity.—To those little familiar with such inquiries, the danger of mistaking one person for another will not appear very considerable; but the fatal errors which have arisen from this source are too well known in the jurisprudence of every country. Besides the curious cases mentioned by Pliny, "Les Causes Célèbres" afford singular instances of confusion of personal identity, as in the cases of *Martin Guerre,* of the child *Noiseu,* of *Jaques Lemoine,* of *Claude de Verré,* and of *De Caille.* In Britain we have the lamentable cases of *Richard Coleman,* of *Clench* and *Macley,* who were executed for crimes of which they were wholly innocent, from mistakes as to their identity; and the unfounded accusation of robbery in the last century, against *Mr. F. Douglas,* and against *Joseph Redman,* and —— *Robinson,* so late as 1824, arose from mistakes of the same nature.

It becomes, therefore, of consequence to point out the circumstances by which personal identity may be rendered doubtful, and to indicate the marks by which it is best established. The first may include the effects of age, climate, aliment, habits, passions, wounds, diseases, &c. The influence of such causes is admirably discussed by Zacchia, in his investigation of the remarkable case of *Andrea Casali,* and is a model for the guidance of the medical jurist in such difficult cases. The circumstances which chiefly enable us to identify one long absent from his native country are, accurate observation of his likeness to his family; his resemblance to what he once was; in some instances his dialect; his recollection of past events; but, above all, the occurrence of scars, or *nævi materni*, known to have been on the individual in question.

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* [The improved system, now adopted in Great Britain for obtaining medical statistics, will doubtless throw much light on this subject.]

IV. Marriage.—Under this head the principal business of the medical jurist is with the nubile age, according to nature, and legislative enactments; and with the physical circumstances affecting the legality of marriages, which may justify divorce.

1. The nubile age, with us, is not below fourteen for the male, and twelve for the female, that being the ordinary period of puberty in our climate; but young persons may after this age be prevented from marrying till the age of majority, by parents and guardians, in England; though this seems doubtful in Scotland.*

Some other circumstances, which are necessary to the validity of marriage in these islands, do not strictly belong to the province of the medical jurist; such as that the marriage be legally solemnized, that the parties be not within the forbidden degrees of propinquity, as fixed by the Levitical Law, and that both parties are free from any other exisiting matrimonial tie. The Levitical prohibition is wisely adopted in modern legislation; as the intermarriages of very near relatives, like the breeding of domestic animals *in and in*, as it is termed, produces degeneracy in the offspring; and *crossing* the breed, in the human species, is favourable to the intellectual, as well as to the physical powers of man.

The freedom from any existing matrimonial tie is of obvious necessity; and knowingly violating this injunction is felony with us. Yet if either party has been absent more than seven years, without transmitting any tidings of his or her existence, the other party may lawfully contract another marriage, which is not dissolved by the subsequent return of the absent spouse.

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* Baron Hume, on the Criminal Law of Scotland.

In some countries marriages, after a certain age, were prohibited. Thus, the Romans of old did not permit a female above fifty to marry any one below the age of sixty, nor the marriage of a sexagenarian, unless with a woman past the age of child-bearing; but this law was repealed by Constantine and Justinian. Modern legislation interferes less with domestic comfort, and leaves such matters to individual discretion. In fact, the Roman law was founded on an anxiety to provide the state with defenders; and they considered fecundity impossible after fifty in the female, or sixty in the male; but this opinion cannot be considered as always true of either sex.

2. The physical circumstances which may invalidate a marriage are, lunacy in either of the parties at the time, and physical inability to consummate. There are instances of this last being pleaded and sustained in our Courts. Certain diseases, such as epilepsy, are held in some countries to invalidate marriage, but not with us.

V. Divorce in these kingdoms may take place in two ways, *â mensa et thoro*, a partial divorce, or *â vinculo matrimonii*, a total divorce. The first will hardly fall under the consideration of the medical jurist; the second may be sustained by proof of a previous marriage not yet dissolved; by want of legal age in the parties at the time of solemnization; in England, by want of consent of parents and guardians, in the case of minors; by want of consent in either of the parties; by mental incapacity at the time of contracting the marriage; by bodily incapacity preventing consummation; by reason of adultery.

The inability to consummate the marriage, may be considered as arising, in every instance, from physical causes. The only detailed decision grounded on *moral* causes, in England, occurred in the extraordinary case of the *Countess of Essex* against her husband, in the reign of James I.; but the whole proceedings in that suit are such monstrous perversions of the plainest dictates of honour and justice, that, I presume, no modern judge would quote it as a precedent. A singular case, in which *impotentia erga hanc* was seemingly admitted as a ground for a divorce, occurred before the ecclesiastical superintendent and ministers of St. Andrews, in the year 1563, soon after the Reformation, when the clergy of Scotland were ambitious of assuming the powers of the ecclesiastical tribunals which had been suppressed. It is the "Processus Divorcii inter Joannem Gyb in Strathor et Margaretam Hillock," printed in 1834, from the registers of the kirk-sessions of St. Andrews. Gyb was impotent towards his wife, but was proved to be *habilis* towards another. The wife sued for a divorce on account of the impotence; but the sentence of the court was on the score of the proved adultery of the husband.

Our laws, however, admit divorce, on the plea of impotence from physical causes, which have from the first prevented consummation. Cases of divorce on account of impotence are seldom detailed in our law books, and, indeed, have more rarely occurred in this country than on the Continent.*

VI. Impotence and Sterility may arise from

1. *Functional Causes.*—Of these, habitual intoxication, excessive venery, and diseases which greatly debilitate, or affect the common sensorium, are the chief. They are generally temporary only. The abuse of spirituous liquids and narcotics may end in the incapability of erection; but in general a return to temperate habits, aided by tonics, will restore the function. Excessive venery, by giving rise to want of due consent between the secerning and erectile organs, may produce impotence, and has caused incurable idiotism. Such diseases as

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* See Les Causes Célèbres; Dictionnaire de Bayle, *arts. Parthenai, Quellenec;* Œuvres de Ambrose Paré; Sanchez, de Matrimonio; Panormus, Sylva Nuptialis; Tagereau; Zacchiæ Quæstiones Medico-Legales.

epilepsy, and affections of the brain and nervous system, are admitted as causes of impotence. But unless they had existed previously to the marriage, they would not be with us recognised as sanctioning a divorce for alleged impotence.

2. *The Organic Causes* are malformation of the genitals in both sexes, or total deficiency of some of them.

3. *Organic Causes of Impotence in Man* may arise from the deficiency of the penis, either natural or accidental. Foderé and Mahon appear rashly to have decided that the loss of a considerable portion of the penis incapacitates from having children. Many instances have been published by Piazzoni, Frank, Mondat, and others, where the loss of nearly the whole penis did not prevent the begetting of children. Little more seems necessary for impregnation than injection of the semen into the vagina, as is proved by the experiments of Spallanzani and Hunter.

Malformations of the urethra are not absolute causes of impotence, unless when the opening is far from the glans. Many men who have *hypospadias* become fathers.*

We must be careful, however, not to infer the want of testes, because none are found in the scrotum. In some individuals they have remained through life in the abdomen, as occurs in the unripe fœtus. They may never have descended from the abdomen, where they are formed in the fœtus; but such persons are often capable of procreation. A single testicle in the scrotum is not a mark of incapability of procreation. The medical man has, in examining such a case, to consider whether the testes be naturally deficient, or have been removed by an operation; in the last case, a cicatrix will remain on the scrotum.

Scirrhous enlargement of the testicles, or other organic changes, in their structure, may produce impotence. A question respecting paternity may occur, when a man dies after a long illness, whether he was capable of being the father of an alleged posthumous child. Such cases must be decided on their own merits; and no better model for guiding our judgment in such difficult questions can be given, than what is contained in Zacchia's discussion of the case of the wife of *Aurelio Lingio.*[*]

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* See Zacchia, Sabatier, and Belloc. [They certainly, however, are less likely to become so, and instances are recorded, in which after the occurrence of hypospadias or epispadias, the individual has ceased to procreate, although previously he had been prolific. Beck's Medical Jurisprudence, i. 931, and Dunglison's Human Physiology, 3d edit. i. 361.]

Sterility in Females may arise from constitutional debility; yet many very delicate females become mothers even when far gone in disease. Excessive leucorrhœa is a common cause of sterility, as is dysmenorrhœa, especially when a membranous exuvium is thrown off. Menorrhagia, as indicating uterine debility, is generally considered as a cause of sterility, as is also amenorrhœa; yet some females have borne several children, who never menstruated.

VII. Pregnancy presents a wide field for medico-legal evidence.

1. *The limits* between which it is possible, belong to the province of the medical jurist. It may be limited to the period during which the catamenia recur; but this varies from under ten to more than fifty years of age. A few remarkable instances of impregnation after sixty are recorded; and instances of very early puberty also have occurred, even so early as about four years; but these are exceptions to a general rule, which should be kept in mind, in judging of imputed pregnancy.

2. *The signs* of true pregnancy should be impressed on the mind of the jurist; for he may be called to determine whether a capital sentence is to be suspended on this plea, or whether an accusation of pregnancy may not, from the effect of disease, be made against a virtuous female. It is in the early months that the principal risk of error lies. The usual signs are, the cessation of the catamenia, the darkening of the areola round

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[*] Tom. iii. Consilium xxiii.

the nipple, the general state of the breasts, the state of the os uteri,* the form of the womb as felt over the pubes; and as the pregnancy advances, the tumefaction of the abdomen, and the motions of the fœtus. Some of these signs are equivocal; but our principal dependence should be placed, in the early months, on the dark areola round the nipple, which is very apparent about the middle of the third month.† Nauche also pointed out how the change produced on the urine, by standing from two to six days, indicates pregnancy. The urine of a pregnant female invariably throws up, on standing at rest, a pellicle of fatty-like matter, which, after remaining on the surface for some days, spontaneously separates, and falls to the bottom, a circumstance which distinguishes it from the mouldy pellicle found in urine in some diseases. The pellicle now described has been called *Kiesteine.* This fact is confirmed by Leuiser,‡ but is denied by Kennedy and Waller. At this period, the stethoscope, applied to the abdomen, affords a certain indication. The female, for this last examination, should be in bed, lying on her back, with a sheet drawn smoothly over the abdomen: place the stethoscope between the navel and the pubes, and an attentive ear will readily distinguish two sounds; a *whirring* one, synchronous with the maternal pulse; and the pulsations of the fœtal heart, considerably quicker, and of a sharper tone. The motions of the child may generally be perceived, and the two stethoscopic sounds heard, after the middle period of utero-gestation. The placental sound* has been heard by Dr. Kennedy as early as the end of the tenth week, but the sound of the fœtal heart not until *quickening*.† The sensation so named is important in English law, which erroneously supposes that life is then only imparted to the fœtus, and denounces capital punishment for procuring abortion *after* quickening, although, before that period, intentionally procuring abortion is only a misdemeanour. Our laws do not permit the execution of a female for a capital offence, while *quick with child;* but pregnancy before this period will not stay execution. The distinction is founded on error; for *quickening* is caused merely by the sudden escape of the gravid uterus from the pelvis, into a less confined position; it has nothing to do with the imparting the principle of life to the fœtus, which was a *living being* long before.

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* [This can be no guide during the early months.]

† [A bluish tint of the vagina, extending from the os externum to the os uteri, has been brought forward as a sure test of pregnancy, by Kluge, of Berlin, and Jacquemin, of Paris. This discolouration, according to Kluge, commences in the fourth week of utero-gestation, increases until the time of delivery, and ceases with the lochia. Parent Duchatelet was present with Jacquemin in many of his examinations, and attests to their accuracy. In the investigation, Jacquemin examined no fewer than 4500 prostitutes. It is a test not easily available in this country; and Dr. Montgomery,—on the strength of a few observations, however,—states, that whilst in some cases the bluish colour was very obvious, in others it was so slight as to be scarcely, if at all, perceptible. See Parent Duchatelet, Dela Prostitution, dans la Ville de Paris, i. 217, and Montgomery on the Signs of Pregnancy, p. vi., and 127.]

‡ [They have likewise been corroborated by Dr. Golding Bird. (Guy's Hospital Reports, April, 1840.) At the suggestion of Dr. Dunglison, a series of experiments was undertaken at the Philadelphia Hospital by Drs. McPheeters and Perry, resident physicians, the results of whose observations have been published recently. (American Medical Intelligencer, March 15, 1841, p. 367.) Taken in conjunction with other symptoms, the appearance of the Kiesteine certainly is a great aid in diagnosis.

Other experiments are in progress by another of the resident physicians—E. Kane—which, so far as they go, correspond greatly with those of Drs. Nauche, Bird, and others. The Annotator has distinctly noticed, in some of the cases, the cheesy odour described by Dr. Bird.]

In examining a female, the jurist must carefully distinguish between the proper motions of her child, and the *rolling* or *passive movement* of the whole uterus, produced by its gravity, as well as between such movements and the pulsations of the maternal arteries, or the effects of flatus in the intestines.

Pregnancy is obscured by the coincidence of various diseases, as of ascites, and it may be confounded with whatever causes tumefaction of the abdomen. In the early months diagnosis may be difficult; but attention to the movements of the child, the stethoscopic indications, the state of the breasts, and the examination of the urine, will be our best safeguards against error; to which we may add, examination of the changes in the neck of the womb, and its general form as pregnancy advances.

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* [It is questionable, whether this sound be placental. It has certainly been heard in case of abdominal tumours pressing upon the great arteries, where no pregnancy existed. Raciborski, Manual of Auscultation, p. 143.]

† Kennedy on Obstetric Auscultation.

The practitioner must also endeavour to distinguish between *extra-uterine conceptions,* where, by an *error loci,* a fœtus is lodged in some part of the abdominal cavity, exterior to the uterus altogether. In such unfortunate cases we must trust to nature for relief.

False conceptions also cause ambiguities before the period when the fœtal movements should be recognised. We must carefully distinguish between pregnancy and disease of the uterus and its appendages, as ovarian dropsy, or suppressed catamenia from an imperforate hymen, which have sometimes led to serious error.

Superfœtation has been considered as impossible in the human subject, because the os uteri is usually closed soon after conception, and the surface of the womb lined with the decidua; but authors of the highest reputation believe that it does take place; and without this it seems impossible to account for viable twins having been born at intervals extending from one to more than five months between their birth.*

3. *Limits of Utero-gestation.* Pregnancy may be protracted beyond nine months, or forty weeks, its usual term; but not so considerably as was once imagined. Ten kalendar months, or three hundred days,† is the extreme limit allowed by the pre-

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* See Capuron, Foderé, Desgranges. Transactions of College of Physicians, Lond. Vol. IV.

† [It is a common error to regard ten kalendar months and three hundred days as synonymous: ten kalendar months, from January to October inclusive, may be three hundred and four days, and from March to December inclusive, must be three hundred and six days.]

sent French code; the Prussian extends it to three hundred and two days, a period sufficient to include every case of protracted pregnancy. The law of England at present has no definite limit; but a case beyond the usual term would go to a jury. The difficulty of any female ascertaining the precise period of her conception is the cause of the discrepant opinions of the physiologists on this subject.

The laws of various countries have, however, extravagantly extended the supposed limits of utero-gestation. Thus, Justinian and Gratian declared a birth legitimate if born eleven and even twelve months after the death of the putative father. In later times, the "Decisiones Frisicæ" declared a child legitimate if born within twelve months; and in England, in the reign of Edward II., the pregnancy of the Countess of Gloucester was held to be legitimate, though her husband was then dead one year and seven months at the time of the application![*] The limits of the French or Prussian codes are perfectly sufficient, and all beyond them may be held as indicating illegitimacy.

Utero-gestation may also be accelerated. Our law recognises the *viability* of a child at six months, and, consequently, its legitimacy six months after marriage; but this is of small consequence as regards the rights of the child, because the marriage of the parents, *before the birth*, legitimates a child in England, and their subsequent marriage at any time in Scotland.

The Roman law admits the legitimacy of seven months' children, and this has been followed in many modern states, as the period at which a child may usually be born *viable*.

Growth of the Fœtus. The human ovum has been recognised as an opaque body, three lines in diameter, about the end of two weeks after conception,[†] but it is more apparent after the third week.[‡] At one month, the end of the embryo destined to become the head is thicker than the other, and the whole is about the size of a common house-fly.[§] Between six weeks and two months, it is ten or twelve lines long, the cranium is divided by the *falx*, the brain is fluid, the skin transparent. At three months it is about 3½ inches long, and will generally weigh 3 ounces; mouth open; nostrils closed; eyes have lids; ears imperforate, though surrounded by a rim; brain fluid.* At four months, it is from 5 to 5½ inches long, and weighs more than 4 ounces;† the brain consists of five masses, of which two, the *corpora quadrigemina*, are the first formed.‡ At five months, the fœtus is about 9½ inches long, and weighs 10 or 12 ounces; lungs small and whitish; the auricles of the heart not distinguishable from the ventricles; brain without convolutions or anfractuosities; eyes closed by the membrana pupillaris;§ in this month, the fœtal motions begin to be perceived by the mother. At six months, half the length of the fœtus corresponds with the xiphoid cartilage; the membrana pupillaris disappears; the scrotum expands; the nails are only rudimentary; cerebellum concealed by the projection of the hemispheres of the cerebrum. The spinal medulla has still a canal in it filled with fluid. At seven months, the organs are so developed that a child may be considered as *viable;* it usually is 14 inches long, and weighs from 2 to 3 lbs.; the middle of the body, or medial line, is between the xiphoid cartilage and umbilicus, but nearer to the former; meconium is found in all the intestines; the testes and ovaries have descended into the pelvis;‖ the brain shows inequalities on its surface. At eight months, the hairs of the head are coloured; the length is 16 inches; the weight from 3 to 4 lbs.; the medial line is now nearer to the umbilicus than the sternum.¶ At nine months the length is usually 18 or 20 inches; the medium weight about 7 lbs.; the mesial line corresponds with the umbilicus.** Tiedemann, even at this period, never found any distinction in general colour between the cineritious and medullary part of the brain.

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[*] Rotulæ Parliamentariæ, vol. ii.

[†] Velpeau, pl. i. fig. 1.

[‡] Ib. pl. i. fig. 2.

[§] Ib. pl. viii.

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* Valpeau, pl. xii.

† Ib. pl. xiv.

‡ Tiedemann.

§ Hunter, tab. xxiii.

‖ Ib. tab. xxi.

¶ Ib. tab. xx.

** Ib. tab xii. and vi.

Can a female become pregnant without her knowledge? When females have been drugged with opiates, or intoxicated, or comatose, congress may, even with a virgin, take place without her knowledge; and there are several instances to show that, in such cases the female may be impregnated. See *Hebenstreit, Capuron, Foderé,* also the very extraordinary case in the *Causes Célèbres,* where a female, supposed dead, and laid out as such, was defiled by a young ecclesiastic, and, though utterly unconscious, was impregnated. The sense of pleasure, then, is not necessary to impregnation.*

VIII. PARTURITION.—This subject is also one of great delicacy, and involves several questions.

1. *Whether it be approaching* in general may be known by indications described in all books on midwifery. The steps of natural, protracted, and preternatural labour should be familiar.

2. *But the signs of recent delivery* are more important to the jurist. These are, the bruised state of the genitals, relaxation of the vagina and of the uterus, the presence of the lochial discharge, the general appearance of the female, and the formation of milk in her breasts. These symptoms, however, can afford no positive indication, if the examination be delayed for ten or twelve days. The relaxation of the external organs, their bruised or swollen appearance, or even the fissure of the fourchette, soon disappear. The lochia continue from fifteen to thirty-five days, but in a shorter time are with difficulty distinguished from other vaginal discharges. The mammæ begin to swell on the second or third day, and soon afford milk; but milk has been yielded by the virgin breast, to the stimulus of

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* [It is not easy to understand how conception can take place without some degree of feeling on the part of the female. It would seem to be indispensable to impregnation, that the fimbriated extremity of the Fallopian Tube should embrace the ovary, and it is not presumable, that this could occur, unless something like pleasure, or, as above remarked, 'feeling' should accompany the act.]

sucking; and even the male breast will on a similar irritation, yield an abundant flow of milk*

The wrinkled appearance of the adominal parietes is the only persistent external mark, though it will not indicate recent parturition, but merely that the woman has had children.

A female under the influence of narcotics, or comatose, may be delivered, without being conscious at the moment of the act. This has been proved in various curious examples, as in the celebrated case of la Comptesse de St. Geran.† See also in Hippocrates the case of the wife of Olympias. But it is certain that the pains and sensations of delivery would undoubtedly arouse the female from natural sleep.‡

The means of aiding Parturition, in cases of deformed pelvis, are by abortion in the early months, by embryotomy, by the operation of Sigault, [Symphysotomy,] and by the Cæsarian section. Those means are justifiable to save the life of the mother, and some of them have occasionally saved both mother and child. The division of the *symphysis pubis*, however, is condemned by our best writers on the obstetric art. The Cæsarian section, as extremely perilous to the mother is not rashly to be attempted. It has been more successful in other countries than with us, probably from the earlier period at which foreign practitioners consider themselves justified in performing the operation, than is usual in Great Britain.

Plurality of Children.—Twins appear to be to single births as 1 : 90[*] triplets as 1 : 6500;[†] quadruplets as 1 : 247,000. Plutarch informs us that the five torches carried at nuptial processions were intended to mark the utmost limits of human fecundity. Four children at a birth were produced at Bromsgrove, in Worcester, in 1818, who were all living in 1837. Five children at a birth were born at Naples in 1838, but they died soon after they saw the light.[‡]

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* Aristotle, Hist. Animal. lib. i. c. 12 and 13. Schenck; Obs. lib. ii. Santorelli. Benedetto di Verona. Causes Célèbres, t. viii. p. 228. Phil. Trans. vol. ix.-ilx. Hebenstreit. Baudelocque. Belloc, Méd. Legale, 69. Blumenbach, Physiologie. Reil. Humboldt, Relation Historique, t. iii.

† Causes Célèbres, t. i. Rigaudeaux in Journ. des Savans for 1749. Harteman in Acta Natur. Curios. Dec. ii. an. 3. Dr. W. Hunter.

‡ [The Annotator was called to a respectable female who had been recently delivered, and who declared to him, that she was awoke from sleep by abdominal uneasiness, and found both the child and the placenta extruded.]

3. *The viability* of the child is very important, and is recognised by the perfection of its organs, the position of the *mesial line*,[‡] the appearance of its nails and skin, the cry of the infant, and its capability of sucking. This is a subject of interest; because in some instances, if a child be born *not viable*, it may affect the succession of property, when the mother dies in childbed; and it may bear on certain cases of alleged infanticide. One other question connected with this subject is, when there is a considerable interval between the birth of twins, whether these are to be considered as conceived at the same time. Many deny the possibility of *superfœtation*, which in such cases is

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[*] [The ratio varies according to circumstances not readily appreciable. In the Dublin Lying-in Hospital it was about 1 in 57. The Irish appear, indeed, to be more prolific than the inhabitants of any other country, judging from the records. Dr. Collins (Practical Treatise on Midwifery, London, 1835,) states the proportion of twins in France to be 1 in 95; in Germany, 1 in 80; in England, 1 in 92; in Scotland, 1 in 95, and in Ireland 1 in every 62. In this country, according to Dr. Dewees, the ratio is about 1 in 75. We have not data, however, to enable us to arrive at positive results.]

[†] [In the Hospice de la Maternité of Paris, about 1 in 9000 cases; in the Dublin Hospital, 1 in 5050.]

[‡] Bulletino della Scienze Mediche, 1839.

[§] [That is, the horizontal mesial line. According to Chaussier, at the full period, the middle of the body corresponds exactly with the umbilicus; at eight months, it is three quarters of an inch higher; at seven months, it approaches still nearer the sternum; and at six months it falls exactly at the lower extremity of that bone. Hence, if these measurements are to be depended upon, should the middle of the body of the fœtus be found to fall at the lower extremity of the sternum it may be regarded as under the seventh month, and therefore not viable.]

contended for by others; but it is a subject involved in much obscurity.*

In Scotland, the viability of a child is determined by its *crying;* in France by its *respiration;* but in England, any *tremulous motion* of its muscles, however trifling, has been decided to *constitute life.*† In other countries, such slight movements would never be received as any thing but the remains of irritability.‡

IX. Monsters and Hermaphrodites.—No living human birth, however much it differ from human shape, can be destroyed without committing a capital crime. The law states that *monsters* cannot inherit; but it has left us in the dark as to what should be considered sufficient deviation from the human form to constitute a monster. Buffon arranges monsters under three classes, 1st, Such as are monsters by excess of organs; 2d, by defect; 3d, by internal deviations from normal structure, discoverable only by dissection.§ *Hermaphrodites* are now considered as beings with malformations of the organs of either sex; and physiology does not admit the existence of true hermaphrodites with duplex perfect organs.

Hermaphrodites were divided by Hunter‖ into, 1. Those with malformations of the male organs; 2. with malformations of the female organs; and, 3. with such deficiency of the generative organs of both sexes as to be regarded as *Neuters.* The opening up of the urethra in the perineum is the most common cause of the first abnormal organization; as in the Negro described by Cheselden, in the case dissected by Saviard, and in the Chevalier d'Eon. Home describes an instance of the second variety in the paper above alluded to. An enlarged clitoris has been sometimes mistaken for a penis. The account of *Marguerite Malaure,* in "Les Causes Célèbres," shows this individual to have belonged to the variety of *Neuters;* as did also the individual described in Baillie's Morbid Anatomy. The *Free Martins* dissected by Hunter, are instances of the same in the lower animals. Among vermes and mollusca, several genera are true hermaphrodites; and such occasionally are observed among fishes and papiliones. The causes of monstrosity have been investigated by Duverney, Winslow, and Haller, who ascribe the repetition of organs to coalition of two perfect germs. Wolff and Meckel ascribe it to abnormal excess of production. The first opinion is defended by Treviranus, Otto, Burdach, Rudolphi, Mayer, and Müller; Bäer and Himly adopt the second. Tiedemann considers monsters by excess as owing to great vascular activity, modified by pressure, and he is followed by Serres and Geoffroy St. Hilaire.*

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* [The cases of Superfœtation on record, (Dunglison's Human Physiology, 3d edit. p. 396 and Beck's Medical Jurisprudence, 6th edit. p. 219,) leave no doubt, that one ovule may be impregnated at one copulation, and another at a subsequent one, provided a short time only elapses between them. It appears also to be certain, that the two products of conception may not be developed in all cases with equal rapidity, but that one may be retarded in its growth, and be born in a very imperfect state along with the other, whose development may be complete.]

† Case of Fyshe *v.* Palmer, 1806.

‡ See the case of *Mattia Bracci* in Zacchia. Capuron. Foderé.

§ Buffon. Barkow's Monstra Animalium per Anatomen indagata Lips. 1828–36.

‖ See Home, in Phil. Trans. 89.

X. PATERNITY AND AFFILIATION become medico-legal questions, when a considerable interval has elapsed between the birth of a child and the death or absence of its reputated father: ten calendar months, (see the note on this subject, at page 41,) being the utmost limit to which modern physiology would extend the period of utero-gestation. This subject involves questions respecting children born during the second wedlock of the mother, the circumstances of posthumous children, the laws of bastardy, and the mode of treating alleged cases of suppostitious children.

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* [The gentleman last named, as well as M. Isidore St. Hiliare, has removed much of the obscurity, that prevailed in regard to the causes and nature of monstrosities.]

The law of Scotland recognises, as legitimate, a child born ten lunar months after the death or absence of its putative father; and to fix bastardy on a child, the absence of the supposed father must continue till within six lunar months of its birth.* In England, a case exceeding the usual time would go to a jury.

Second marriages are not permitted to take place by the Code-Napoleon, until six months after the death of the husband; and this, with the professed object of preventing doubts of the paternity of the offspring of the woman. The old Anglo-Saxon law forbade them for twelve months. No period is fixed by the laws of Britain. The circumstances of the case would be considered in such investigations; and probably the likeness of the child to one of the husbands would influence a jury; though a child, certainly, may bear no resemblance to its real father.

Posthumous Children may give rise to an *inquisitio de ventre inspiciendo;* in which the widow, alleged to be gravid, is examined by a jury of matrons, who are to report her state to a common jury.

The bastardy laws of England and Scotland are now nearly assimilated; and the oath of the female may be opposed by that of the man, as to no carnal knowledge of her person.

Supposititous Children.—This subject may give rise to very intricate questions, in which the medical jurist may be called to decide, whether the marks of recent delivery in the female correspond with the apparent age of the infant. If the navel-string be still attached, this will show that the child has only been born a few days; but no sort of medical examination can positively exclude the substitution of one infant, of the same age, for one of a different sex and constitution. The difficulties attending such investigations are illustrated by the precautions considered necessary in royal births in England, and by the legal proceedings in the cases of the *Annesley peerage,* and in the celebrated *Douglas cause.*

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* Erskine's Institutes.

When a female pretends to be pregnant, to be delivered of a child, and exhibits one to a father as his, much difficulty may sometimes be felt in disproving her assertions. The history of her pregnancy will be our safest guide in the investigation of doubtful cases.

XI. Presumptions of Survivorship.

1. *When a mother and her new-born infant are found dead,* important civil rights depend on the question, which lived the longest; as the husband's right to be *tenant to the courtesy,* or the descent of property derived *from the mother.* The law of England in such cases admits such slender proofs of life in the fœtus, as would not be received elsewhere, and leaves much to the evidence of a medical witness. Elsewhere, the child must either cry or look around to constitute a quick birth; but in England a quiver of the lips has been received as a proof of life, in defiance of physiology. In most cases, the presumption of survivorship will be in favour of the mother; especially if the birth have been premature, or if the child be extremely large in proportion to the maternal organs.

2. *When two or more persons perish by a common accident,* without any but probable means of ascertaining who perished first, as in cases of shipwreck, or on a field of battle, the descent of property may become the subject of dispute. Such questions have been rarely decided in Britain; but probably should be determined on the principles laid down in ancient Roman law, or in the Code-Napoleon.

In the cases of General Stanwix* and of Colonel James, the English courts recommended a compromise between the parties, which was agreed to: In Taylor *v.* Diplock, Sir John Nicholl decided,† that the husband lived longest. Zacchia has decided several cases of survivorship, in common accidents, on the principles of Roman law; and in the Code-Napoleon provision is made for most cases of survivorship that may occur; and some good remarks on this subject occur in Foderé.

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* Fearne's Posthumous Works.

† Phillips's Reports.

XII. Mental Alienation.—This interesting subject presents a wide field for speculation to the medical jurist. It consists in *an erroneous judgment on the ordinary affairs of life, and on subjects on which men usually think alike, occurring in one fully awake.* The method employed in the legal investigation of insanity, and the forms necessary before an individual can be consigned to any asylum, are proofs of the importance attached by the laws to such inquiries.

The jurist should be familiar with the four forms of insanity, *Mania, Monomania, Dementia,* and *Amentia,* and be able to indicate the leading symptoms and the most judicious treatment of each. This is the arrangement of Pinel, and is sufficient for the purposes of legal medicine. The jurist should be able to detect feigned cases of insanity, and to prevent real lunatics from being treated as criminals.

Mania is a general insanity, in which the delusion extends to all manner of subjects, and is more or less marked by mental excitement. It often is attended with most extravagant conceptions, sometimes with a complete upsetting of the judgment; at other times by a sort of dreamy delirium, which presents every thing in false lights to the mind of the sufferer. It may be marked by the highest fury, or by a demeanour, in which the experienced eye can alone detect any aberrations of the intellect. This depends on constitution, both mental and bodily. The precursors of mania sometimes exist long before it is observed by the friends of the patient, but not unfrequently he feels uneasy sensations in his stomach, before any uneasiness in the head or confusion is complained of. These premonitary symptoms are succeeded by mental agitation, broken sleep, or watchfulness. Sometimes a restless eye, and unusual movements of the body, are the first perceptible indications of the disease. Sometimes the maniac is taciturn and dejected, at other times vociferous, and much inclined to laughter.

The disease returns in paroxysms of fury; and these are succeeded by calms, during which the individual appears quite rational, unless reminded of his delusions. In mania, the sensations are deranged, so that he can support vast bodily exertion, and long watchfulness, without seeming fatigued. The appetite is depraved, voracious or much impaired.

The decline of the disease is marked by the gradual disappearance of the morbid hallucinations, and by the increasing capability of the individual to recur to the subjects of his late disquiet, without any return of disorder.

There is no difference between a removeable and a confirmed maniac [case of mania,] except in the duration of the disease. It is very erroneous to ascribe all cases of mania to organic changes in the brain. Such causes produce irremediable mania; but when it arises from functional disorder of the brain, it may be removed by time and judicious treatment.

Monomania or *Melancholia* is characterized by the dominance of one sole morbid idea, or of a confined class of ideas. The insane idea may be gay or melancholy; it very often is the offspring of inordinate pride and self-conceit, which give the sufferer extravagant notions of his own importance, of his vast wealth or power: thus monomaniacs sometimes imagine themselves kings, emperors, or the Deity.

When a monomaniac has shown any inclination to shed blood, it is long ere he loses that morbid idea; and in general such persons are always to be regarded as objects of suspicion. Pinel records an instance where after years of tranquillity, which gave perfect confidence to his keepers, a monomaniac suddenly resumed his ideas of what he called "*the baptism of blood*," and killed several fellow patients before he was overpowered.

Fear of eternal damnation is often the dominant idea in melancholia, and is most distressing to the sufferers. It is apt to drive them to suicide. It is often the consequence of religious fanaticism; but very frequently occurs in persons who, before their insanity, had not shown any strong religious feelings, and certainly not unfrequently seems the consequence of remorse for real transgressions.

Monomaniacs are often sensible of the aberrations of other insane persons, while unconscious of their own extravagance. They frequently show extreme mental acuteness on subjects not connected with their own hallucinations, and occasionally can reason on such subjects with great ingenuity.

Monomaniacs are prone to suicide when their ideas are gloomy; and such persons require constant watching. In some persons *tædium vitæ,* urging to suicide, is induced by want of employment; and the catastrophe might have been averted by some useful occupation, which withdrew the mind from insane associations. Such persons are apt also to meditate, in their insanity, on destroying others, and have been known to cherish a thirst for blood for very long periods. Such patients occasion much embarrassment both to physicians and to judges, from the difficulty of drawing the line between real insanity and intended malice.

Dementia.—The symptoms which characterize this state are a rapid succession of ideas, without any apparent connexion; a current of objects most chimerical, following each other with almost inconceivable rapidity, often expressed by incessant babbling, or a torrent of words uttered with a volubility that defies imitation, with a mobility of temper, passing from joy to grief, from calmness to anger, with the rapidity of lightning, without an apparent object. Such persons will repeat the same word for an hour; sometimes the movements of the lips are the only sign by which the torrent of ideas is indicated. It differs from mania, inasmuch as in mania the reasoning faculty may remain entire, though the premises on which the judgment is founded be false; but in dementia the reasoning and judgment seem scarcely exercised at all.

Amentia or Idiotism may be either congenital or accidental. Of the first, many instances occur in our hospitals; but of this state the most remarkable is the *Cretinism* found in the deep valleys among the Alps. Accidental idiotism may arise from blows on the head, from sudden terror, from tumours in the brain, from changes in the consistence of that organ, or from apoplexy.

Idiots are seldom loquacious. They often give no answer to a question but *no* and *yes,* and do not readily commence a conversation. The mania of drunkards is apt to end in amentia, when it has repeatedly occurred. Amentia is the form of insanity least likely to be cured. Pinel mentions instances of a conversion of amentia into mania, terminating in a cure of the insanity.*

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* [To these forms of insanity may be added *Moral Insanity*, first, perhaps, recognised and described by Dr. Prichard. (Cyclopædia of Practical Medicine, Art. Insanity, and Treatise on Insanity, p. 13, Lond. 1835.) In the last work cited, the following description is given of this variety, "There are many individuals living at large, and not entirely separated from society, who are affected to a certain degree by this modification of insanity. They are reputed persons of singular, wayward, and eccentric character. An attentive observer may often recognise something remarkable in their manner of existence, which leads him to entertain doubts of their entire sanity, and circumstances are sometimes discovered on inquiry, which assist in determining his opinion. In many instances it is found, that there is an hereditary tendency to madness in the family, or that several relatives of the person afflicted have laboured under diseases of the brain. The individual himself is discovered, in a former period of life, to have sustained an attack of madness of a decided character. His temper and disposition are found, on inquiry, to have undergone a change, to be not what they were previously to a certain time; he has become an altered man, and this difference has perhaps been noted from the period when he sustained some reverse of fortune which deeply affected him, or since the loss of some beloved relative. In other instances, the alteration in his character has ensued immediately on some severe shock, which his bodily constitution has undergone. This has either been a disorder affecting the head, a slight attack of paralysis, a fit of epilepsy, or some fever or inflammatory disorder, which has produced a perceptible change in the habitual state of the constitution. In some cases, the alteration in temper and habits has been gradual and imperceptible; and it seems only to have consisted in an exaltation or increase of peculiarities, which were always more or less natural or habitual." "Individuals," he adds, "labouring under this disorder are capable of reasoning or supporting an argument on any subject within their sphere of knowledge that may be presented to them; and they often display great ingenuity in giving reasons for their eccentric conduct, and in accounting for and justifying the state of moral feeling under which they

State of the mental powers in insanity.—Derangements of sensation and perception cause that insensibility to cold and fatigue, which we often find in insane persons. To the same cause we may ascribe the disorder of the appetite, of the generative function, and the insensibility to bodily suffering. Diseased perception produces the seeing of what exists not beyond the brain of the maniac. We must, however, recollect; that there is a state in which spectral appearances are observed by persons who do *not* labour under insanity, but are capable of discrimination between those illusions and real objects. Of this singular state we have curious instances recorded by Nicolai, by Dr. Alderson of Hull, Dr. Ferriar, of Manchester, and Dr. Hibbert. The last two are separate works; but the first may be found in the Transactions of the Royal Society of Berlin,

appear to exist. In one sense, indeed, their intellectual faculties may be termed unsound, but it is in the same sense in which persons under the extreme of strong passions may be generally said to have their judgment warped, and the sane or healthy exercise of their understanding impeded. They think and act under the influence of strongly excited feelings, and a person sane is, under such circumstances, proverbially liable to error both in judgment and conduct."

Dr. Prichard also admits a delusion which he terms Instinctive Madness, or Insane Impulse—the *manie sans délire*, of Pinel, which may be considered as a variety of moral insanity. In this, the will is occasionally under the influence of a disordered impulse, which suddenly drives the person to the perpetration of acts of the most revolting kind, and to the commission of which he can have no motive. Examples of this are homicidal impulse, impulse to burn or pyromania; impulse to suicide, to steal, &c. &c.

The most characteristic features of moral insanity are enumerated by Dr. Prichard, as follows:—"a state of excitement, absence of reserve, garrulity, propensity to make extravagant purchases, total disregard of veracity and of moral obligations in general, irresistible propensity to drinking fermented and other intoxicating liquors, perfect selfishness, dislike towards relations and friends, proneness to suspicion, melancholy," &c. But the reception of these mental manifestations as evidence of insanity has been objected to, inasmuch as illusion or hallucination has been regarded as essential to it and a criterion of its existence. The admission of moral insanity has certainly given rise to singular verdicts in our courts of justice, and has been a loop-hole through which criminals, who ought to have forfeited their lives on the scaffold, have been suffered to escape. (See Prichard, Art. Insanity, in Tweedie's Library of Medicine, on Nervous Diseases, Amer. edit. p. 178. Philad. 1840.)]

or in Nicholson's Journal, vol. vi.;* and Dr. Alderson's in the Edinburgh Medical and Surgical Journal, vol. vi. I have known several instances of this in persons not insane; but many more in those labouring under *Delirium Tremens,* from the abuse of spirituous liquors. The affection in *Delirium Tremens,* as in other species of spectral appearances, seems to depend on turgescence of vessels in the brain. In the latter a few leeches have removed the appearances; but in delirium tremens, opiates are safer remedies than any species of bleeding.

Deranged attention and memory are very usual in insanity, especially in dementia, where the patient often cannot fix his attention for a moment on any subject. Sometimes an insane person can command his attention to one subject alone; but this is less common than to find his attention morbidly fixed on one train of thought, without any remarkable disturbance of the other mental faculties. Both in idiotism and in melancholia, the memory is often much impaired; but there have been instances in which the memory, in mania, was preternaturally acute during the paroxysm.

Imagination and association of ideas are suspended in idiotism, but in other kinds of insanity they are often extremely active, creating images of the most extravagant description, and combinations of the wildest character. Real objects are often transformed in mania; thus a straw garland becomes to the maniac an imperial diadem, a tattered cloak the mantle of royalty. These impressions are extremely vivid; and sometimes they give rise to confusion of personal identity.

Derangements of reasoning and judgment occur in insanity; but often the conclusions of maniacs are very logically deduced if the premises be granted; at other times, we find the reasoning erroneous, as well as the judgment founded on it. Sometimes both faculties are suspended or annihilated in insanity.

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* [It is contained in Haslam's "Medical Jurisprudence, as it relates to Insanity" being one of the Tracts on Medical Jurisprudence, reprinted in this country by Dr. Cooper, Philad. 1819.]

The derangement of the moral faculty is the cause why maniacs are not considered as accountable agents. They are incapable of discerning the criminality of such an act as killing a person, from a fancied command to do so from Heaven, or in order to secure to their victim a happy immortality. Such derangements have led to the most horrible catastrophes, such as a father or a mother, in a fit of insanity, killing their own children. Insanity often produces marked changes in the moral character and habits of individuals; and whenever we observe such changes occurring *suddenly,* insanity is not far distant. On the other hand, a return to usual habits and modes of thinking, is a favourable indication of returning rationality.

Causes of Insanity.—The remote causes are obscure, and not to be traced to any known principle. Sometimes insanity is hereditary; sometimes it depends on physical derangements of the constitution; at other times it seems to arise from very vivid mental affections of the most opposite kinds.

The hereditary predisposition, no doubt, depends on some faulty organization of the brain; in which a child may resemble its parent, not less certainly than in the features or the person. This hereditary insanity may assume any of the forms of the disease.

The melancholic temperament is predisposed to the disease, especially when this is accompanied by dyspepsia, or has led to gloomy views of religion. To such persons enthusiastic fanatical instructors are dangerous guides, and have often driven the too susceptible disciple to madness and to suicide; but we must recollect that all patients, who in madness, are under religious horror, have not lost their reason from what is called religious madness. It often supervenes when the insanity evidently was brought on by debauchery of various kinds, or when the individuals were previously of depraved habits.

Defects in education may induce insanity. Excessive indulgence encourages an overbearing disposition, which is dangerous in those who have any hereditary taint. Undue severity, on the other hand may produce the same in susceptible minds. Insanity may be induced by exciting passions and depressing emotions. Thus, anger when immoderate, which causes congestion in the brain, sudden terror or horror, sudden good fortune or severe disappointments, unwonted calamity, jealousy and remorse, may be considered as among the existing causes of mental alienation; sudden changes in the manner of living, exposure to cold while heated, some diseases, pregnancy, have all seemingly brought on the maniacal paroxysm; but of all the causes of insanity, in this country, at least, intemperance is probably the most frequent. Excess, especially in spirituous potations, is certainly one of the most frequent causes of derangement,* which often begins in *Delirium Tremens,* and ends in complete insanity. Such persons generally soon recover in an asylum from a first or second attack; but, unfortunately, on returning to society, the enslaving vice renews its hold, and ends in permanent loss of intellect. Excess in sensual gratifications may be considered as conducing to the same calamity.

Treatment of Insanity.—A good hospital for the insane should have sufficient space for the buildings, separate yards for each class of patients, and gardens and airing-grounds for the exercise and amusement of convalescents. Each patient should have a separate sleeping-room; the wards should have good day-rooms, for the meals and associations of the convalescents; and the patients should be classed according to the state of the disease. Convalescents of a superior class in society should be in a separate part of the establishment from persons of vulgar manners; because when recovering, they become sensible of having been accustomed to better society, and the irritation thence arising often retards their complete recovery.

Hospitals for the insane should have no appearance of a

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* [According to the Annotator's experience this is inaccurate. If delirium tremens be excluded from the calculation, excess in spirituous liquors is certainly not, in this country, " one of the most frequent causes," of mental derangement.]

prison; and therefore grated windows should never be employed, but, in their stead, such hospitals should have iron window-frames, with moderate sized panes of glass. The windows may conveniently be made on the *swing* principle, instead of the common sash, and should be provided with a stop, to prevent their opening so far as to permit the escape of a patient.

In all hospitals for the insane, there should be rooms for noisy and dirty patients, as far removed as possible from those intended for convalescents.

Each ward should have a commodious day-room for the meals and association of convalescents. A scullery or washing-room, a warm-bath, with a *dome* over it, and a water-closet, should be connected with each ward. A court or yard should be connected by a staircase with each ward; and each court should, if possible, only be overlooked by its own ward. If gardens can be attached to the hospital, for the occupation of convalescents, they will add much to the utility of the establishment.

The form of a St. Andrew's cross, with long galleries, 10 feet wide, and bed-rooms on one side, may be considered as the best form for a lunatic asylum. The bed rooms intended only for a single patient in each, may be 10 feet long, by 8½ wide, and 12 or 14 feet high. With these precautions, an asylum may consist of several stories.

Government.—All public establishments for the insane should be under the inspection of an active and intelligent committee, who should see that all the officers do their duty.

A most important functionary is the governor or superintendent. He should be a man of vigorous body, of good mein and pleasing countenance, but, above all, of a firm mind, and placid temper. The matron should possess similar qualities. Under them should all the keepers, nurses, and servants, be placed, and taught to consider them as their master and mistress. The keepers and nurses should never, on any account, be permitted to strike or to insult a patient; nor should they have the power of inflicting any sort of punishment, or of using any means of restraint, except when ordered to do so by the governor o matron.

The means of restraint are only to be employed when patients are furious, and threaten to injure themselves or others; and when the end is obtained, the restraint should be removed as soon as possible. The best means for this purpose are leathern manacles, leg-locks and straps, and leathern muffs. The muff is preferable to the strait-jacket, as more comfortable to the wearer, and less expensive. When patients are very unruly, they are sometimes put to bed, and secured there by straps. This soon quells fury, and prevents the poor patient injuring himself by his violence. Much may be done to restrain patients by mild yet firm discipline in the house, and by conducting all the operations, in which the patients are concerned, with precision, order, and quiet regularity.* The meals should be served up with neatness and punctuality. The food should be plainly but well dressed, afforded in due quantity, and of good quality.

No clandestine correspondence should be permitted between the inmates of an asylum and those without its walls. The visits of friends and relatives should be regulated by the physician of the establishment; and all visiters should be excluded, who do not bring an order for admission from the directors or medical officers of the establishment.

Exercises and Avocations.—The importance of finding amusement and out-door exercises for lunatics is now generally admitted, though too little attended to in the public establishments of this island. Games which require some exertion, such as bowls, skittles, fives, hand-ball, and the like, are excellent adjuvants in accelerating the recovery of convalescents. Within doors, chess, backgammon, cards, and draughts, are excellent occupations, combined with reading such publications as the Penny and Saturday Magazines, Chambers' Journal, &c. which combine amusement with instruction, and interest, without too strongly exciting the mental faculties. Newspapers and magazines, are also useful in the day-rooms of convalescents. Of course, these occupations are only suited to the latter stages of insanity, after the thick cloud which had obscured the faculties is dissipated, and before the intellect has acquired sufficient vigour wholly to resist morbid associations,—ere the patient is in a perfectly fit state to enter again into society.

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* [In some Institutions for the Insane, all mechanical means of restraint are dispensed with. When the patient is unruly, he is placed in a chamber in which there is nothing which he can injure, or with which he can injure himself, until his furor subsides. Attendants are provided to keep a perpetual surveillance; and firmness, and benevolence are exhibited by them towards the unfortunate objects under their charge. This system is said to have been so effectual, at the extensive Insane establishment at Hanwell, Middlesex, England, under the medical superintendence of Dr. Conolly, that the coercion chairs have been abolished, and the only relics of them perceptible, are the flooring of the Carpenter's Shop, into which they have been worked.]

Many patients, from choice and previous habits, can assist the servants in domestic duties and arrangements, and this should always be encouraged; for such persons recover their reason more quickly than those who brood over their hallucinations in indolence and apathy. The system of employing the insane in this way, is extensively acted on in an admirable establishment for their treatment, the *Dol-huis* at Amsterdam. If a convalescent shows an inclination for any of the fine arts, it will in general facilitate his cure, if he be encouraged to pursue it. This acts in the same manner as the more usual manual occupations, by diverting attention from insane associations. Gardening, attending to flowers and shrubs, walking, and riding when the patient can afford it, are very serviceable to convalescents. Workshops and turning-lathes for men, sewing, knitting, painting, and music, for females, are salutary occupations, for the same reason.

The *Moral Treatment* of Insanity is more important than mere medical prescriptions.

The first important step is gained by the order, discipline, and regularity of the establishment, without harshness or uncomfortable restraint. A patient soon acquires the habits of the place, and learns to appreciate any restrictions which are not aimed at him individually, but are intended to keep up regularity in the establishment.

A physician or a governor acquires a moral influence over his patients, by showing that they are considered worthy of confidence; that no promise made to them is broken; that no mark of contempt is exhibited towards them.

Presence of mind, and confidence in our own power, exert a great moral influence over the insane, and will often save an attendant from peril in his intercourse with maniacs. Firmness, with a placid look and manner, will often give a superintendent or a physician great command over the insane, so as to render harshness or restraint unnecessary. The insane resemble children in some respects: they are to be addressed as reasonable beings, to be won by kindness, to be restrained with temperate firmness, and to be corrected, when in fault, without anger, or appearance of irritation.

The very furious and perverse will not, in general, recover, unless restraint of some kind be employed; but it must never be forgotten, that, in such establishments, no more restraint should be employed than is absolutely necessary to prevent the unfortunate being from hurting himself or others: while the order and economy of the house are to be maintained by a mild but firm administration; rather like the authority of a parent over children, than the rigid severity of a task-master toward a dependent.

The chief legal questions that may fall under the decision of the medical jurist, are,—

How to distinguish the disease, and to prove a man insane? The difficulty is in cases of what is termed *partial Insanity* or *Monomania,* where the individual studiously conceals his feelings, or refuses to answer questions. The best method is to ask him to detail his own symptoms, to suffer the patient to tell his own story, and carefully to avoid awakening his suspicions about the object of your inquiries. Insane persons often see and hear what has no existence beyond themselves; and may, by cautious cross questioning, be got to confess it. They often believe that they are persecuted by secret enemies, to whom they ascribe their illness. The spectral appearances they perceive, they believe to be *realities;* whereas the spectral appearances seen by persons not labouring under insanity are soon recognised by such persons to have no existence but in their own brain.

Perplexity to judges and physicians arises, where men have great peculiarities which seem akin to insanity. On the trial of such a case, it was well ruled by Lord Erskine, that where the act in question did not appear affected by the singularity or partial insanity, it should be allowed to be good in law; but where the act itself partook of the peculiarity which led to the suspicion of insanity, it should be annulled.* Lord Eldon, in the case of *Mr. Greenwood,* seems to have held a contrary opinion; but this tria ended with a compromise.† In the case of Lord Ferrers, he was held criminally responsible, although he had been occasionally insane, and had heightened his natural infirmity, on the morning of the criminal act for which he suffered, by drinking.‡ In the case of *Bellingham,* the circumstance of his having been before insane, and in confinement, and the seeming want of special motive for the murder, were not admitted to palliate the act; and the law, then laid down by our best authorities, is, that such acts cannot be excused, unless it be proved that the person was insane at the moment of the commission. In the cases of Margaret Nicholson and Hatfield for attempting the life of King George III., their insanity was admitted to take away the capital part of the charge.§

By the existing law of England, when a person is insane, before he can be committed to an asylum, he must be visited by two medical men, who must certify in writing that he is a fit subject for restraint; and such certificate will not entitle the keeper of a lunatic establishment to receive him, if seven whole days have elapsed since it was signed. Every asylum must be registered and licensed: the number of rooms, and of the patients it can receive, must be specified to the magistrate; and no alteration can be made in such house, without previous notice to the visiting magistrates, who have power to enter the premises at all times. Every patient must be reported to the clerk of the commissioners or visiters, by the keeper of the establishment, within seven days after his reception.

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* Case of Lord Chedworth.

† Vesey's Reports.

‡ Collinson on Lunacy, vol. i.

§ Ibid.

2. Is there a real lucid interval? The lucid interval, in the legal sense, is a total cessation of insane ideas, between the paroxysms of insanity. Such intervals probably do really not exist, though insanity often assumes an *intermittent* form; but until convalescence is *established*, that is, until the insanity has disappeared, a suggestion of the insane train of thought would probably bring back the delusion to the mind of the individual.

3. What period of life is most liable to insanity? The period of life most liable to insanity is from 30 to 40; and the next from 20 to 30.

4. What diseases are most liable to be confounded with it? The affections most liable to be mistaken for insanity are hypochondriasis, hysteria, and habitual intoxication. In hypochondriasis, there is always dyspepsia present, and the delusion is chiefly on the person's own health: his fears are for himself; his mind is wavering and credulous; yet, when this disease subsists long, it is apt to degenerate into insanity. The symptoms of hysteria resemble those of mania: but the cessation of a fit generally leaves the person rational. Habitual intoxication produces a species of madness, which will render a man legally unfit to manage his own affairs; but yet this state will not free him from criminal responsibility.*

5. Whether it has increased in these kingdoms? The returns of persons confined for insanity in Great Britain, have led some writers to contend that insanity has increased among us; but this is a mistake. Notwithstanding the increased consumption of ardent spirits, and the prevalence of mercantile gambling in

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* Rydgeway v. Darwin, Collinson, vol. i.

Great Britain, Willan and Heberden showed this as regards London; and Burrows has proved it as respects England. Dr. Powell's tables seem to indicate an increase: but even from them, the increase is shown not to be progressive with the population; and in the parliamentary returns published in 1819, we find an absolute decrease in the number of the insane in England and Wales since 1813, though the population had increased in that period. The same fact appears, from the registers of the Parisian hospitals, to hold also in that city.

Feigned Insanity is best detected by comparing the signs, in any case, with the progress of real insanity. The impostor rarely can preserve the solemn dignity of mania, the omnipotence of the ruling idea of melancholia, or the unpremeditated flow of ideas of dementia. The impostor will be too solicitous to impress the physician with the reality of his insanity, to carry on his deception consistently. He will generally not feel offended at being considered as insane, which usually gives high offence to the true maniac. He will yield to the stimulus of hope and fear, and act accordingly; while the true maniac is insensible to either. The flow of his ideas will not be so unpremeditated as they are in dementia, and he will hesitate in choosing his expressions, and repeat the same words, in order to make his madness appear more likely.*

Melancholics are prone to suicide, therefore must be watched narrowly. Sometimes we must secure their hands with a *muff*, to prevent these attempts on their own lives.

The introduction of religious worship in public hospitals for the insane, was condemned by Pinel, and by some of our own writers on insanity; but it has been introduced with advantage to convalescents in some of the German hospitals, and in several of our British establishments for the insane. It is favourably spoken of by Dr. Ferrus of the Bicêtre: in the Quakers' Retreat at York, in the Lancaster, Dundee, Montrose, and Aberdeen hospitals, it has been introduced, and is recommended by the physicians of those establishments.* Those only should be permitted to attend, who are considered by the physician sufficiently recovered to do so with advantage.

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* See Crichton on Derangement; Pinel; Esquirol; Burrows; Haslam; Prichard.

The Medical Treatment of insanity is simple.

Copious bleeding is a hazardous practice, and has seemed to render insanity incurable.† Topical bleeding is sometimes useful in the early stage of insanity; and, in a few cases, cupping on the nape of the neck has been found useful in the young and plethoric.

Blisters have been employed with advantage, but should not be applied to the head. Setons are seldom requisite, and are inconvenient for the furious. They are chiefly useful when the disease has supervened on the ceasing of some vicarious discharge, or on suppressions in the female.

Immersion in the cold-bath is now justly exploded in this disease. Still less do we use forcible submersions; but the tepid bath is prescribed most advantageously; and the means of using it should be supplied in every hospital.

The *douche* of cold water on the head is a valuable mode of repressing fury. The patient should first be put into the tepid bath, and the douche from a pipe $\frac{1}{10}$th or $\frac{1}{8}$th inch in diameter be suddenly allowed to descend on his head from a height of about three feet.‡ Two or three minutes should be the utmost limit of its continuance.

Purgatives have been long used; but very drastic ones are not necessary. The milder purgatives in general will do, except where there is strong determination to the head. When the patient complains of abdominal soreness or uneasiness, the mild-est laxatives will answer best. Purgatives are chiefly necessary to obviate costiveness. When obstinate diarrhœa supervenes, with pain in the bowels, it is an unfavourable symptom, and requires Dover's powder in moderate doses, frequently repeated.

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* [It has likewise been introduced advantageously into the insane asylums of this country.]

† Pinel.

‡ [The Annotator is in the habit of using a douche of larger diameter than this, the shock from which is greater, and therefore, the effect more powerful in taming the furious. He has often used it of the diameter of the arm, and even of a larger size than this.]

Emetics are sometimes useful, especially when the patient is troubled with much viscid phlegm, or with excessive secretions from the mouth and nose. Emetics do not form good general remedies in insanity, though much praised by some practitioners.

Opiates have been much given by some; but I consider large doses of them rarely beneficial. Small doses, frequently repeated have generally succeeded better in my practice; and I seldom prescribe more than two grains for a dose. One is often sufficient to produce sleep.

I have no opinion of digitalis, aconite, tobacco, or camphor, in this disease.

XIII. THE RIGHTS OF THE DEAF AND DUMB are secured by law; and if the intellect be perfectly sound, there is now no question of their perfect competence to enjoy all the civil rights of other subjects of the state. They can intimate legal consent by signs, or by writing; and should be considered as responsible agents.

The deaf and dumb may be indicted for a crime, and are amenable to the laws, as other individuals. This was established in England by the trial of *Jones,* in 1773, who, though born deaf and dumb, was sentenced to fourteen years' transportation for stealing five guineas. The deaf and dumb may give evidence as witnesses, as was ruled in the trial of *William Bartlet* for larceny in 1786, when *John Ruston,* a deaf and dumb person gave evidence against the prisoner, and his sister was sworn as interpreter on that occasion.* The same was admitted in

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* Phillips's Law of Evidence.

Scotland, in a case of a rape on a deaf and dumb girl, which was tried before the Supreme Court. But in the trial of *Jean Campbell* alias *Bruce*, in 1817, for the murder of her illegitimate child, it was found impossible to explain to her that she might plead *guilty* or *not guilty;* and she was dismissed *simpliciter* from the bar on this account. Had this person been instructed on the system of those who teach the dumb to speak, as she was not deficient in intellect, such a difficulty could easily have been surmounted.

The first person who taught the dumb to speak was Pedro de Ponce, a Spanish monk, who died in 1584. No work of his is known on this subject; but in 1620, Bonet, secretary to the High Constable of Castile, published an essay, in which he took the merit of inventing the art. In 1692, J. C. Amman published his "Surdus Loquens," in which he is silent on the writings of his predecessors, but described well his method of teaching a young lady, born deaf and dumb, to pronounce words and to read.

Long afterwards, the Abbé L'Epée was a successful teacher of the art in France, and was succeeded by Abbé Sicard. About the middle of the last century, Mr. Braidwood, of Edinburgh, taught the art with great success in this city: an interesting account of his school may be seen in Pennant's Travels in Scotland in 1772. The publication of the Abbé L'Epée was in 1759; he died in 1790. The family of the Braidwoods in three generations continued to practise their useful art; and Dr. Watson established a school for the deaf and dumb near London, 1792. There is an excellent school of this kind in Edinburgh, under the superintendence of Mr. Kinniburgh.

XIV. MALADIES EXEMPTING FROM PUBLIC DUTIES belong to the medical man, both in his civil and military capacity. He may be called to decide whether a man be fit, without imminent injury to his health, or danger to his life, to perform the duties of a juryman, of an officer of justice, or to serve in the navy or the army. In all such cases the certificate of health must be carefully drawn up, on an honest consideration of each case, and a fearless determination to do justice.

Diseases may disqualify from military service, and medical men are the judges in such cases. A recruit to be examined is stripped naked, and carefully examined by military surgeons, who report on his state, according to directions issued from the war-office. The code of such directions or regulations, in the French service are very minute, and are well arranged under several heads. Abstracts of the French code of this subject are contained in the "Médecine Légale" of Belloc and Briand.

Of late years, much attention to this subject has been paid by our Army Board, and very full and useful directions are to be found in the work of Henry Marshall, Esq., Deputy-Inspector-General of Army Hospitals.* Valuable statistics on the army have appeared in the parliamentary report published in 1838.

All authors are agreed on the waste of human life occasioned by the too early levies of recruits for the army. Enormous mortality in the armies of Napoleon arose from the extreme youth of the conscripts, with which they were filled up. All our best writers agree, that a man is not fit for the active duties of a soldier, until he has attained the full age of twenty-one; and that no recruit under that age, should be sent to our tropical colonies. Experience in the late peninsular war, and in our colonies, confirms the justness of the observation.†

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* "On the Enlisting, the Discharging, and the Pensioning, of Soldiers." Lond. 1832. Sir James M'Grigor, in Medico-Chir. Trans. vol. vi.

[The second edition of Mr. Marshall's work has been reprinted in this country, with the addition of the regulations for the recruiting service, in the army and navy of the United States, by Dr. Ruschenberger, U. S. N. in the American Medical Library, and Intelligencer, Philad. 1840.]

† [The duties of the examining surgeon of the army of the United States in regard to the admission of recruits are as follows:—

Medical officers, whose duty it may be to examine recruits, will be particular in causing each recruit to be stripped of all his clothes, and to be made to move

XV. Simulated Diseases present a field of investigation requiring caution and discrimination. It may be the duty of the medical man to aid the magistrate in the detection of the guilty impostor, or the military tribunal in consigning to merited punishment the pretended invalid. No questions require more professional skill, more self-possession, or more knowledge of human character.

This subject has been admirably treated by Zacchia, under the following heads:

1. The jurist must not confine his attention to mere medical inquiries into such cases, but examine the probable motives which the individual may have to feign himself ill.

2. He must compare the causes capable of producing the alleged disease, with the age, temperament, and habits of the person examined.

3. Any repugnance or indifference to the remedies which commonly give relief in such cases, should be noticed.

4. Note whether the symptoms be present, which characterize the disease, or whether any of them be inconsistent with it.

5. Mark well the alleged succession of the symptoms, and observe whether they follow a natural course.

The maladies most usually feigned are madness, nostalgia,

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about and exercise his limbs in their presence, in order to ascertain, whether he has the free use of them; that his hearing and vision are perfect, that he has no tumours, ulcerated legs, rupture or chronic cutaneous affections, or other infirmity or disorder, which may render him unfit for the active duties of a soldier, or be the means of introducing disease into the army; and it shall be their duty to ascertain, as far as practicable, whether the recruit is an habitual drunkard, or subject to convulsions of any kind, or has received any contusions or wounds in the head, which produce occasional insanity.

With any of these defects the man is to be refused as unfit for service. It will also be the duty of the examining surgeon to ascertain, whether the recruit has had the varioloid, or vaccine affection,—and if he has not, to see that he be vaccinated immediately after the enlistment, or as soon thereafter as practicable. It is the duty of the recruiting officers to be always present at the examination of the recruits, by the examining surgeon. Ruschenberger, op. cit. p. xxviii.]

epilepsy, or other convulsive diseases, hysteria, syncope, pains in different organs, as the head, stomach, bowels, and kidneys, rheumatism, blindness, pretensions to be deaf and dumb, jaundice, paralysis, incontinence of urine, hæmaturia, hæmoptysis, and hæmatemesis, cachexia, tumours, dropsy, hernia, ulcers, fever. In general, threats or painful remedies will detect feigned madness, convulsions, hysteria, syncope, and local pains; minute inspection and inquiry will usually detect other simulated diseases. Valuable examples of such detections are given by Zacchia, De Haen, Fodéré, Vetch, and Marshall.*

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* [In the army and navy, the simulators of disease are termed "malingerers;" and great ingenuity is required in their detection. The work of Marshall, already cited, contains much valuable information on this matter, and some extraordinary cases of deception. In the army and navy of the United States, malingerers are not very frequently met with. This has been attributed, in some measure to the period of enlistment being generally limited to three years or five at the most, instead of for life as in the British Army. For this reason, the most dissatisfied soon learn to tolerate their situation, which is never in itself very unfortunate, and look forward with certainty to the day of their discharge, which is seldom so distant as to shut them off from the hope of their being free from their engagement, without incurring the risk of punishment or discharge. Besides, there is no advantage gained by being discharged, except freedom from the terms of contract, the law not having provided any pro ratâ pension based upon length of service,—Ruschenberger, op. cit. p. xx.

Professor Dunglison has given a table of feigned, pretended, simulated or excited diseases or disqualifications, with the mode in which they are feigned, and the means of detection, in his Medical Dictionary, p. 257. Philadelphia, 1839.]

SECTION II.—INJURIES TO PROPERTY.

I. Nuisances from Manufactories, &c.—These may affect the property of our neighbour in different ways; or the nuisance may be a public one. The first is what is termed a private nuisance, and may be abated by an action for damages; the second is a common or public nuisance, and the proper remedy is by indictment. The remedy by indictment is not known, I believe, in Scottish law. In this country, the only legal mode of abating such nuisances open to an individual who feels himself aggrieved, is by interdict and action for damages, before the Court of Session; a very tedious and costly method of obtaining redress. The English law allows of an indictment in cases of a common nuisance. In certain cases the injunction of a court of equity will stay the nuisance in a summary manner.

It was at one time ruled, "that usefulness should compensate for noisomeness, and that, unless it could be proved *deleterious* to the health, a manufacture, however disagreeable, might be introduced into a town;" but by several later decisions of our judges, it is sufficient to prove that the nuisance complained of is very disagreeable, and renders the property of a neighbour less valuable, or diminishes in a marked degree the comfort of his life. In judging of such cases, a medical man is often on delicate ground, between parties deeply interested in the issue of the cause; but we may in general terms conclude, that what is very disagreeable to the olfactory organs of most persons is injurious to health; and now it is sufficient to prove the very offensive nature of the nuisance, to obtain its abatement or suppression.

The principal nuisances which are likely to become the subjects of an action are:

1. Establishments or manufactures in which offensive odours are either naturally given out, or generated by *putrefaction*,—such as the erection of privies, piggeries, cattle-pens, slaughter-

houses, cemeteries, collections of decaying animal and vegetable substances, steeping of hemp and flax, starch-making, dealing in various animal matters, as in the trades of the *knacker* and *gut-spinner*.

2. Manufactures which evolve noxious or offensive effluvia by the *aid of heat*,—as in sugar-refining, dyeing, glue-making, hartshorn and ivory-black works, Prussian blue-making, rendering of fat and tallow, boiling of whale and fish-oil, leaf-horn manufactories, varnish-making, soap-works, acid-making, alkali works, preparation of chlorine, smelting-houses, coal-gas works, turpentine-making, unconsumed smoke from steam-boilers, &c.

Much more legislation has been exerted on the subject of noxious or offensive manufactories in France than in this country. The subject was submitted to the physical class of the National Institute, who made an elaborate report on it in 1804; and some years later, the numerous complaints against various works carried on in Paris gave rise to an imperial decree in 1810, in which the various works are judiciously distributed into three great classes; and the formalities indicated which are indispensable for the erection of new manufactories in towns and villages.

The first class consists of such manufactories as ought not to be carried on near private houses, and are thirty-two in number. Works for starch, fire-works, Prussian blue, gut-spinning, purifying of pit-coal, purifying of wood charcoal, collections of rags, large works for glue, catgut, rendering of fat or tallow, horse-killing, aquafortis, sulphuric acid, impure tallow-melting, menageries, plaster-furnaces, lime-kilns, manufactures of minium, parchment, drying of night-soil, hemp-steeping, of sal ammoniac, artificial soda, oil-cloths, slaughter-houses, peat charring, collections of old clothes, scalding-houses, varnishing paste-board, varnish-making, hoof and horn-oils.

The second class contains twenty-three such manufactures as are not absolutely to be prohibited near human habitations, but ought not to be erected except after hearing all sides, and leave granted,—as white-lead, candles, curriers' work, blankets, stores or stocks of green-hides, distilleries, foundries, metal-refiners, tallow-melting, making of ivory-black, lamp-black, plumbing, shot-making, dissecting-rooms, tobacco-works, wax-cloth manufactures, cow-houses, dyeing, Hungary leather, glove leather, steam-engines, bleaching by chlorine, silk-winding.

The third class comprehends those works which may be near habitations, but should be under surveillance,—as alum works, button-making, braziers' work, wax-works, parchment, starch, and glue-works on a small scale, horn-flattening, type-founding, wet-gilding, paper-staining, soaperies, vitriol-making.

The distribution appears, on the whole, to be judicious, and is deserving of imitation in other countries.

3. Manufactures which *corrupt or pollute streams or springs*,—as bleaching, dyeing, tanning, gas-making, lime-burning, and the like. The acrids employed or generated in several of these processes have been found very detrimental to fisheries. Several species of the genus *salmo* are destroyed or banished by the pollution of their usual haunts; yet, where the river is large, it is remarkable how soon the stream recovers its purity. Thus, the inky waters of the Irwall, at Manchester, are utterly unfit to support such fish; yet the ampler Mersey, a few miles below the junction of the two streams, abounds with various species of *salmo*, especially the smelt or S. *eperlanus*.

4. Establishments that become nuisances from their *noises*,—as the business of the tin-plate worker, the copper-smith, the trunk-maker, the boiler-maker, tilting machinery, &c. Yet habit has a wonderful effect in reconciling persons to accustomed noises; so that sometimes they are not only insensible of their continuance, but would infallibly awake on their suddenly ceasing.

II. Arson. The crime of wilful fire-raising can rarely become the subject of medico-legal investigation, except when there is a doubt whether the alleged fire may have arisen from spontaneous combustion. Spontaneous combustion may arise in inert matter from—

1. *Friction or percussion*, by which the latent heat of bodies is suddenly converted into sensible heat. Forests have been set on fire, it is stated, by the friction of their branches during a storm; and machinery has been fired by the rapid revolution of its parts. Percussion gives rise to considerable increase of temperature; rapid hammering will heat an iron rod so as to set combustibles on fire; and even the punching of holes in metal plates by machinery, extricates a considerable degree of heat.

2. *By fermentation* of vegetable matter. The fermentation of the refuse of the tannery imparts sufficient warmth in greenhouses; the fermentation of horse litter, or of animal dung, has been employed to hatch chickens, both in ancient and in modern Egypt, without incubation. The fermentation which takes place from the stacking of damp green hay, appears to be similar, and is often sufficient to set fire to the stack. But, in the spontaneous combustion of any dry materials,—as of collections of linen rags, roasted bran, and powdered charcoal, the heat excited appears to be owing to the rapid absorption of watery vapour, which, when condensed, gives out its latent caloric in sufficient quantity to cause ignition. Fires, suspected of being wilful, have often been thus kindled; and the medical jurist should be aware of the fact, when delivering an opinion on similar cases.

3. *By chemical action*,—as in the effect of drying oils on hemp, flax, cotton, and on some powders, as charcoal, and black oxide of manganese; the action of nitric acid on essential oils, indigo, &c., or the mixture of oil with wool. In this way fires have happened, in the arsenals of France and Russia, in particular; and in this country, accidents have occurred which seem to have arisen from this cause. It is well known, that if recently prepared *drying oil* be mixed with very dry lampblack, and rolled up in canvas, they will soon ignite. It has also been found that *wool-combings*, or woollen cloth impreg-

nated with animal oil, and laid in large heaps, will undergo a species of combustion, and might set fire to the premises in which they are deposited.

Under this head also may be advantageously discussed the singular combustions of the human body, which have sometimes led to accusations of murder, when the event was due to spontaneous changes in the living body. The spontaneous combustion of the human body, commencing during the life of the sufferer, is now well established. In most of the cases recorded by Lair, Kopp, Ploucquet, and others, there has been either a fire or a candle to ignite the body; but, in these cases, the inadequacy of the combustibles around the body to consume the soft parts, and even to calcine the bones is too obvious to warrant our belief that such effects could have taken place, had not some extraordinary changes in the body itself prepared it for combustion.*

The accusation against *Sieur Millet, of Rheims,* for murdering his wife, is a proof of the importance of caution in deciding on such singular cases.†

III. Forgery and Falsification of Documents.—This may be of two kinds:—

1. *Forgery of Engraved or Printed Bills.*—The admirable invention of Bank Bills and Bills of Exchange may be traced to the beginning of the 13th century: and Capmany has shown that the Spanish merchants of Barcelona were familiar with such bills before the end of that century.‡ The circulation of bank-notes in Great Britain in 1810, equalled £43,915,000; but this is a small sum compared to the circulation of *private bills,* which the late Benjamin Heywood, Esq. estimated at not less than £300,000,000 annually;§ while the utmost calculation of our metallic currency never was more than £30,000,000.

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* [The cases on record are now numerous, and certainly establish, that a preternatural combustibility of the human body may be produced; but it is not probable that any case of spontaneous combustion has ever taken place.]

† See Le Cat, Lair, Foderé, Causes Célèbres.

‡ Memorias Istoricas.

§ Individual Credit, 1819.

The importance of preventing forgeries, in a great commercial country, then, where public and private bills form an immense portion of the circulating medium, has given rise to various contrivances for the prevention of frauds. This has been attempted by introducing peculiarities in the manufacture of the paper, as the use of *water-marks,* and colouring the pulp; but ingenious knaves have imitated both successfully. It has been also attempted by employing complicated designs, not easy of imitation. The most ingenious and successful effort of this kind is the multiplication of the same design, by Mr. Perkins's machinery, through which the *same figure* cut on steel, afterwards hardened, may be indefinitely multiplied, by being transferred to copper. The success of this method is proved by the very few forgeries which have taken place on the banks which have employed his plates. Substitution of one sum for another has sometimes been made. This is easiest prevented by the multiplication of the word or figures on the face of the note, and also by care in the manufacture of the printing-ink. It is found that an ink composed of lamp-black, Prussian blue or smalt, with copal varnish, is more difficult of erasure than common printers' ink.

2. *Falsification of Deeds*, and forgeries of names, have been committed by the erasure of the common ink used in the signatures. Common ink is usually effaced by diluted nitric or oxalic acid, by solutions of chlorine, by caustic alkalis, and by butter of antimony. All these substances soften or injure the texture of the paper, but the traces of this injury have been effaced by washing, sizing, and pressing the paper. If these steps have not been carefully performed, however, the writing may, in some instances, be restored; the erasure by acids, in that case, becomes manifest on the application of an alkali—the effect of alkalis by acids; but chlorine may leave no trace of its employment, except the extreme whiteness of the paper. In deeds and writings of importance a good preventive would be to use as an ink a solution of copal in oil of lavender, coloured by lamp-black. The defect of this ink is, that it is apt to become

thick, and not to flow freely from the pen; but it cannot be erased by the means already noticed. A better ink may be formed by dissolving gluten of wheat in pyroligneous acid, and using this as a vehicle for a carbonaceous powder. The proportions which I recommend are: 1 lb. of fresh gluten to 10½ of ordinary colourless pyroligneous acid of sp. gr. 1033; and, with each fluid ounce of this liquid, 12 grains of fine lamp-black and 2 grains of indigo are incorporated by trituration.*

IV. Coining of False Money.—The care with which the die is prepared will not always secure against frauds of this sort, as the coin itself offers a ready means of obtaining a mould of sufficient sharpness for the purpose of the coiner. The object of such persons is to pass off base alloys for pieces of gold and silver. These may be detected by deficient specific gravity. The specific gravity of pure gold = 19.30; of standard gold = 18.88; of fine silver = 10.62; of standard silver = 10.34. But, in the ordinary business of life, this is not a practicable test. Most of the base alloys are much less sonorous than the precious metals, and the sound is therefore employed to ascertain the genuine coin. All coin is alloyed with copper, which imparts hardness, and prevents loss in *wearing:* this quantity, in our mint, amounts to two parts of alloy for every twenty-two of pure gold or silver, or 1-12th.

1. *Debasement of Gold* is ascertained by dissolving a given weight of the alloy, cut into small pieces, in pure nitric acid. This will leave the gold, but dissolve the baser metals; and the weight of the residue, washed and dried, gives the quantity of gold present. The nature of the alloy may be found by different chemical tests. The simplest method of detecting the intermixture of too large a quantity of alloy, is by the change of colour perceived when a streak is made on *touchstone,* and compared with the streak formed by needles of metal of ascertained purity; but chemical examination, or the test of specific

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* See Trans. Roy. Soc. Edin. vol. xiv.

gravity are to be preferred. There is only one debasement of gold coin not to be thus detected. Gold coin has been debased by platinum. If the attempt be made to form an alloy, it spoils the colour of the gold; but at Rouen it was accomplished by plating the platinum with gold so nicely as to give the piece its due weight. Cutting such a coin will detect the fraud. If an alloy has been made, it may be detected by the colour being grayish, or by dissolving the whole in nitro-muriatic acid, when the addition of muriate of potassa or of ammonia to the acid solution throws down a yellow precipitate, if platinum be present.

2. *Debasement of Silver* is usually detected by *cupellation*. The weight of the button of silver left on the cupel gives the quantity of silver in the alloy. It may also be found by dissolving the alloy in nitric acid, and precipitating the solution by muriate of soda: the precipitate blackens by light, and affords the means of ascertaining the quantity of silver in the compound.

SECT. III.—INJURIES AGAINST THE PERSON.

These may be A, such as do not imply the loss of life; or B, such as usually endanger or destroy life.

A.

I. Defloraton.—The signs of defloration are obscure. The state of the sexual organs has been chiefly relied on for indications of the loss of virginity, and in particular the rupture of the hymen; but the hymen has been found entire in some females who have had carnal intercourse with man. This has been affirmed by Teichmeyer, Brendel, Pinæus, and Gavard. The hymen has occasionally been found entire in puerperal females by Mauriceau, Ruysch, Meckel, Walther, Monro, Baudelocque, and Chaussier; and is sometimes naturally wanting, or may be destroyed by disease. The appearance of the nymphæ, and the size of the vaginal orifice, are not certain indications, any more than the appearance of the carunculæ myrtiformes, or the firmness of the mammæ. The mammæ have been found as firm in some persons notoriously unchaste, as in many virgins; and a smart attack of illness will often in the latter produce flaccidity of the breasts. An artful female might easily counterfeit the pain attendant on the loss of virginity, or increase the tonicity of the vagina by the use of astringents. It is only by considering all the signs together, that we can arrive at any just consclusion.

II. Rape.—This crime consists in the forcible knowledge of a woman against her will; her resistance must be continued to the utmost while she retains her senses or the power of struggling with the ravisher, unless she may have yielded to the immediate fear of death. It is not a *rape,* without these conditions being complete; the woman otherwise is supposed to have consented to the act, which may indeed have commenced in violence, but have terminated with her consent. An *infant,* however, under ten years of age, cannot give legal consent; and whoever has carnal knowledge of such an infant either with or without her consent, is guilty of a capital crime.* The proofs of rape, besides the consistency of the woman's story, mainly depend on the marks of violence on her person. If a virgin hath been violated, the injury to the sexual organs, with the precautions mentioned under defloration, will be taken into consideration. If a married female be the victim, we must look for bruises on her person, or injuries she may have inflicted on the ravisher during her resistance, which last are accessory proofs of no small importance. The crime may be perpetrated on a prostitute. It is a rape, if the act be forcible, and against her will. The slightest penetration is sufficient; emission is not now required to be proved. Lord Coke, however, maintained that it was; and even more lately, it was held to be essential by a majority of the Twelve Judges of England; but by a recent statute,* emission is not considered essential to constitute rape.†

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* [It would appear that the punishment of death is awarded for this offence in only one state of the union—Massachusetts. In New York, it is punished by imprisonment in the state prison. "In Virginia, Connecticut, New Hampshire, Maine, New Jersey, Illinois, Ohio, Michigan and Tennessee," says Dr. Beck; Medical Jurisprudence, 6th edit. i. 153, Philad. 1838, "the punishment is either imprisonment for life, or a term of years, or fine, or imprisonment, or both." All these specify the period of *ten* years. The law in Vermont varies from this. It directs, that whenever any individual, over the age of fifteen, shall abuse any female under *eleven,* with or without her will, he shall suffer fine and imprisonment. In Indiana, the age of the female is extended to *twelve* years, and the punishment is imprisonment for a term of years. In Missouri, a rape on a female under the age of ten years is punished by castration. In Delaware, the law directs a fine, standing on the pillory for one hour, sixty lashes on the back well laid on, imprisonment for not more than two years, and afterwards to be sold as a servant for a term not exceeding fourteen years.]

Any penetration, though not sufficient to rupture the hymen, was held, in the case R. v. *Russen*,‡ as not invalidating the charge of rape; but Baron Gurney, in a case where the hymen was not ruptured, held that the penetration was not sufficient to constitute a rape.§

Where the evidence is too defective to prove penetration, the defendant may be convicted of an assault.

The physical signs of rape soon pass away; and unless the female be inspected within ten days after the alleged violence, we shall, in most cases, vainly seek for confirmation of the allegation from inspection. The charge of rape is not invalidated by the female conceiving, nor by the occurrence of syphilis in the woman.[?]

Rape was not a capital offence in England until the 13th of Edward I. William I. punished it by castration and loss of the eyes.* In 18th of Elizabeth it was made a capital felony, without benefit of clergy; and the redemption of the life of the man, by the consent of both parties to a marriage, was taken away.†

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* Geo. IV. c. 31, § 18.

† R. v. Cox, 1 Mood, C. C. 337.

‡ 1 East, P. C. 438, 439.

§ R. v. Gammon, 5 C. & P. 321. [In this country, the disposition almost universally is to consider penetration, alone, to be sufficient evidence as to the carnaliter cognovit.]

III. Mutilation.—*Demembration,* mutilation of the face, cutting, or maiming, are capital crimes by Lord Ellenborough's act. The extent of the injury may often be referred to a medical man; and in a case of *slitting the nose,* an English judge overruled the objection of the prisoner's counsel, "that the nose was only *cut,*" by stating, "the surgeon swore it was *slit;*" and that slit was anciently synonymous with cut.‡

Castration was always, in Britain, considered as a capital offence, even when other *mayhems* (as mutilations are termed in English law) were punished by fine and imprisonment.|| In France, the perpetrator is condemned to hard labour for life, except where it has been "immediately provoked by an outrage against modesty." Castration, long after the infliction, may be recognised by the cicatrix of the wound.

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* See Bracton, Lib. iii. c. 28.

† [The punishment for this aggravated offence varies in the different states of the Union. In New York, the acts now in force prescribe imprisonment for ten years in the state prison, for the offender and his accomplices; and an assault with intent to commit a rape may be punished by fine, or imprisonment, or both. It has also been enacted more recently, that every person who shall have carnal knowledge of any woman above the age of ten years, without her consent, by administering to her any "substance or liquid," which shall produce such stupor, or such imbecility of mind or weakness of body as to prevent effectual resistance, shall, upon conviction, be punished by imprisonment in a state prison not exceeding five years.

In Massachusetts, Rhode Island, Delaware, and South Carolina, it is a capital offence. In Connecticut, Georgia, Illinois, Indiana, Ohio, Maine, New Hampshire, New Jersey, Vermont, Pennsylvania, Virginia, and Michigan, imprisonment for a term of years, or for life, is directed; in Louisiana, imprisonment and hard labour for life; and in the states of Missouri and Arkansas the punishment is castration.—Beck, op. cit. i. 160.]

‡ [The term, "slitting," occurs in the laws of several of the United States.]

|| [In Delaware and North Carolina, it is punished with death.]

B.

IV. Criminal Abortion.—The laws of England recognise this crime only after the period of *quickening*, on the false idea that then only life enters into the fœtus. Quickening is merely the mechanical escape of the gravid uterus from the pelvis into the abdomen, and usually takes place in the fourth month of utero-gestation. Before this has taken place, causing a woman to abort was formerly not a crime in the English code, though it was in that of France; and ought to be so; for quickening has nothing to do with the life of the fœtus, which has been a living being long before. The law of Scotland formerly excluded the idea of murder from abortion, or destruction of a future birth, whether quick or not.* Yet, by later decisions, the High Court of Justiciary has punished the procuring of abortion by fourteen years' transportation. Since the passing of Lord Ellenborough's act,† abortion, before quickening, is now a felony, though not a capital offence, and it has been ruled, that the administering a drug incapable of producing the effect, if with the design of causing abortion, and even if the female be not with child at the time, comes within the meaning of the act.‡ A most singular anomaly, till very lately, existed in the law of England on this subject, namely, that although abortion after quickening, by medicines administered for that purpose, was a capital felony, yet producing it at that period of pregnancy, by means of instruments, the most certain method, was not even an indictable offence.|| But this anomaly was done away by a statute of 7th of William IV. and 1st of Victoria, c. 85, sect. 6. In France, criminal abortion is punished in the female by imprisonment; and, if perpetrated by a medical man, he is condemned to hard labour for a certain time.§

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* Hume, i. 274. † 43d Geo. III. ‡ Rex. v. Phillips, 1811.

|| Rex. v. Codd and Pizzy, 1808, in the case of Cheney.

§ [In New York, the administering to any woman, pregnant with a quick child, any agent, or employing any instrument, with intent to destroy the child, The chief means by which abortion is sought to be accomplished are, by blows and bruises on the abdomen, by the administration of drastic purgatives, or other medicines acting violently on the human frame, by repeated venesection, and by the introduction of pointed instruments into the womb. None of the means, except the last, are certain in their operation, but all are highly dangerous to the mother; and one who only essays abortion, may thus commit a double murder. In cases of alleged abortion, the medical witness has to consider the involuntary causes which may produce it; as accidental falls and blows, strong mental emotions, errors of diet and regimen, spasmodic diseases; and he should balance these against the marks of premeditated design.

The proofs of recent abortion are nearly the same as those of recent delivery.

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unless this shall be considered necessary by the physicians, in case the death of the child or mother is thereby induced, is considered to be manslaughter in the second degree, the punishment for which is not less than four, and not more than seven years in the state prison.

The artful killing of an unborn quick child, by any agency to the mother, which would be murder if it resulted in the death of the mother, is deemed manslaughter in the first degree, and punished by imprisonment not less than ten years.

The attempt to induce criminal abortion is punished by imprisonment in a county jail, for not more than a year, or a fine of not more than five hundred dollars, or both. This law likewise exists in Ohio; and if the woman be quick with child, the offender, in case of the death of the child or mother by the agent employed, is imprisoned in the penitentiary not more than seven years, nor less than one year.

In Connecticut, the administering of any noxious agent for the purpose of procuring the miscarriage of a woman quick with child, is punished, on conviction, by imprisonment during the natural life of the offender, or for such other term as the court may determine. In Missouri, the administration of poison with intent to procure abortion, is punished by imprisonment for a term not exceeding seven years, and a by fine not exceeding three thousand dollars. See the excellent art. by Prof. J. B. Beck, in Beck's Medical Jurisprudence, 6th edit. i. 451; or Researches in Medicine and Medical Jurisprudence, by J. B. Beck, M. D., &c. &c., p. 170. Albany, 1835.]

V. Infanticide.—By the laws of Britain, the mother who concealed her pregnancy till she was delivered of a dead child, or who, during labour, failed to cry out for assistance, or whose infant disappeared after birth, was formerly held guilty of infanticide; and many convictions and executions took place on this cruel statute. The Scottish laws on the subject of concealment of pregnancy were always more severe than those of England; and although our statutes were evidently framed to punish the making away with illegitimate children, yet there are instances of married women, living with their husbands, being tried for child-murder, of which the only proof was the concealment of pregnancy, or neglecting to call for help while in labour.* In later times, very moderate proof of these three circumstances was held sufficient to invalidate the capital charge. Even in England, in cases of the murder of bastard children, contrary to all the usual forms of justice, a statute of James I. threw the *onus* of proving her innocence on the mother; and it was not until the 43d year of George III. that this iniquitous law was repealed, and the same rules of evidence here applied as in other cases of murder.†

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* Cases of Catherine Smith, 1701, and Margaret Dickson, 1724.

† [In several of the states, mere concealment of a bastard child is severely punished.

In Massachusetts, the woman is fined not exceeding fifty pounds. If she conceal the death, whether the child has been murdered or not, she is punished by being set on a gallows with a rope about her neck, for the space of one hour, and is farther bound to her good behaviour at the discretion of the court.

In Vermont, if a woman be privately delivered of a bastard, and it be found dead, and if there be presumptive evidence of neglect or violence on the part of the mother, the punishment is a fine not exceeding five hundred dollars, and imprisonment not over two years,—one or both at the discretion of the court.

The law of Connecticut resembles that of Massachusetts; and in New Jersey, New Hampshire, and Michigan, concealment of the death of a bastard is made a crime punishable with fine or imprisonment.

In Pennsylvania, the concealment of the death of a bastard child is not esteemed conclusive evidence to convict the party indicted of the murder of her child, unless the circumstances attending it be such as shall satisfy the minds of the jury, that she wilfully and maliciously took away the life of the child.

This subject involves some very nice points of legal medicine. The proofs of the child being born alive enter into the case. It must be proved to have arrived at such maturity that there is a probability of its living; its body should be carefully inspected for marks of wounds or bruises; its exact weight and length should be ascertained; the appearance of the umbilicus, and remains of the cord, if still attached, should be examined; its cavities should be opened, lest there be traces of injuries sufficient to have caused death, found in the head, abdomen, or chest; the state of the peculiarities in the fœtal circulation, and of the organs of respiration, must be examined; and we must observe whether the lungs seem to have been dilated by breathing, or remain in the dense condition and backward position they have before respiration has commenced. The weight of the lungs, their colour, and whether on being handled they emit the sound denominated *crepitation*, should be carefully noticed.

This leads us to consider the celebrated *docimasia pulmonum*, or test by their sinking or floating in water, which was at one time regarded as indisputable proof of the death of the child, before or after birth, but has now been considered as ambiguous. If, however, we try the lungs together with the heart, with that organ separated, each lung separately, and also detached portions of the lungs, we shall generally find little difficulty in deciding the important question, especially if attention be paid to the quantity of blood in the lungs, and the state of the *ductus venosus* and *d. arteriosus*, the contents of the air-tubes, and of the alimentary canal. We must carefully distinguish between the effects of artificial insufflation of the lungs after death, and their floating from respiration, or from incipient putrefaction. In cases of artificial insufflation, the whole lungs will not float, and the air may be squeezed out of a cut portion of the lungs, so as to sink in water; whereas, it is not possible,

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The law of Rhode Island is similar, and in Georgia and Illinois the concealment of the death of an illegitimate child is punished with imprisonment.

Much interesting information, in regard to the legislation of various countries on this subject, is given by Prof. J. B. Beck, op. citat.]

by compression with the thumb and finger, so to free from air a dilated portion of lung that has respired, that it will not float.* Putrefaction may be distinguished by the smell, and the air not being in the cells, but in oblong globules in the cellular tissue uniting the cells, or under the pleura covering the lungs.

The chest of a full-grown child, which has not breathed, will usually measure 2 to 3 inches transversely, and about 2 to 2½ from the sternum to the spine. When the same child has breathed, its chest would be from 3 to 4½ inches wide, and about 3 in depth. Lungs which have breathed will be found to cover the lateral portions of the pericardium; but lungs which have not breathed will lie in the posterior part of the chest; in the first case they will weigh more than in the latter, although *specifically* lighter; because, on the first inspiration, a larger quantity of blood enters the lungs. The average weight of the undilated lungs, at the full time, varies from 430 to 600 grains; but when respiration has taken place, their weight is rarely under 1000 grains.

Lungs which have breathed will occasionally sink in water, for the infant lungs are not at once expanded; and weakly children have lived even for two or three days, without the expansion of the lungs being sufficient to float them in water. Hence, in making the test, we should try each lung separately, and also, if the whole lung sink, make the experiment with different portions of it.

Artificial *insufflation* after death may be distinguished from the consequence of breathing by the lower portion of the lungs remaining still dense, while the superior portions may float; but, according to Béclard, it is still better ascertained by the possibility of squeezing out the air from lungs artificially insufflated, by pressure between the thumb and fingers, or by twisting portions of that lung in a linen rag, below the surface of water, so as to cause such portion to sink; while no force of the hand is capable of depriving a lung that has breathed of its air, so as to cause it to sink in water.

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* Marc, Béclard.

Insufflation after death likewise cannot induce the entrance of additional blood into the lungs. Respiration is always attended by the entrance of a considerable quantity of blood into the lungs: this increases their absolute weight; and, as remarked by Daniel, on cutting and squeezing the lungs, this additional blood may be used as one test of respiration. Yet the want of any comparative standard must render this test alone, as well as the relative weight of the lungs and the body proposed by Ploucquet as a proof of respiration, of small practical value.

The child may have cried, and consequently breathed *in utero.* This very rare occurrence may very partially dilate the lungs before birth; and the possibility should be borne in mind by the jurist.*

The effect of putrefaction in obscuring the hydrostatic test is not considerable. The lungs are the least putrescent of all the soft parts of the body, while they remain in the chest; the state of the whole body, and the smell would, therefore, indicate whether the floating of the lungs arose from putrefaction. In such instances the air is not contained in the air-cells, but will form regular bullæ on the surface of the lungs, distinguishable by the eye from the appearance of lungs inflated by the act of respiration.

Morbid changes in the structure of the lungs might cause them to sink although the child has breathed, as in what is called hepatization; but this state is readily distinguished by the eye and the touch, and is, besides, very rare in the fœtus.

Infanticide from strangulation, from drowning and from mephitic air, may be distinguished by the marks to be mentioned under *asphyxia.* Infanticide may be produced by *omission,*—as by neglecting to tie the navel-string; in which case the body will appear bloodless, the great vessels near the heart, and that organ itself, will be empty. The child may perish, if not removed from the discharges which accompany delivery; and the possibility of this happening, without any fault of the mother, must be taken into consideration. The infant may die from exposure to cold. If it be found in a remote or sequestered situation, that would be ground for suspicion. If there be meconium discharged from its bowels; if it exhibit marks of starvation, in the emptiness of its alimentary canal; or if it appear to have been fed, we may be sure that it was born alive, and probably perished from criminal neglect. Any artificial objects, such as articles of dress, found near the child, should be carefully preserved; and if foot marks are seen there, they should be accurately measured and noted.

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* Kennedy, on Obstetric Auscultation, p. 138.

In cases of exposed infants, it is very important to ascertain the real mother. As such exposure usually takes place soon after birth, comparing the age of the infant with the signs of recent delivery on the suspected mother is the best method of proving the connection between them.

VI. Homicide.—It is only with culpable homicide, and with murder, that the medical jurist has to deal. When a person is found apparently dead, a medical man may be required to inspect and report on the cause of death. He should of course, first ascertain whether it be a case of real or only of apparent death. This sometimes is not easy. Singular instances of resuscitation from apparent death are noticed by authors, which should make us pause ere we hastily pronounce a person dead, without evident causes for his death appearing on his body. Pliny mentions several instances of resuscitation when the body was on the funeral-pile, and even when it was too late to save the individual. The Emperor Zeno appears to have been entombed alive. Lord Bacon* mentions several instances of persons buried as dead, whose bodies, on opening their coffins, were found bruised and turned, in their efforts to escape on resuscitation; and Winslow and Bruhier have given much curious information on this subject.* Neither the pallor of the face and lips, insensibility to stimuli, cessation of the organs of respiration and circulation, loss of heat nor even stiffness of the limbs, are infallible criteria. Until along with these, we have the marks of incipient putrefaction or decomposition, we cannot be absolutely certain that a person is quite dead; and, in all cases of doubt, we should wait for incipient putrefaction ere we sanction interment. Where the symptoms appear at all equivocal, we should scarify, or apply hot oil to some parts of the skin.

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* Historiæ vitæ et mortis.

To obviate the chances of such horrible accidents, some cities in Germany have established houses in which bodies are laid before interment, until putrefaction indicates the reality of death. With us, especially in large towns, the bodies of the poor are too quickly interred, and those of other persons often too quickly enclosed in their coffins.

Judicial Exhumations have been made in this country at various periods, from a few days to several months, or even after a year. I disinterred two bodies by order of the authorities, which had been more than five months buried, and detected a large quantity of arsenic in the stomach of one. At Bristol, a female was disinterred after being fourteen months in the earth, and arsenic was found in her stomach. Welper of Berlin found arsenic in bodies considerably more than eighteen months buried.

The changes which bodies, as well as their envelopes, undergo in the grave, have been well examined by Orfila,† who establishes several important points in this branch of Legal Medicine, as the influence of soil, season, age, sex, and constitution, in promoting decay. In Europe, twenty-five species of living insects have been found in buried bodies, and these are included in nineteen genera. The larvæ of *Musca Tachina* is the most common. I found them quite active in a body that was buried, soon after death, on the 9th of December 1838, and exhumed by me on the 10th of May 1839.

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* Winslow, An mortis incertæ signa minus incerta a Chirurgicis quam ab aliis Experimentis? Paris, 1740.—Bruhier, Sur l'incertitude des Signes de la Mort. Paris, 1742—45.

† Exhumations Juridiques. Paris, 1826.

Here it may be proper to describe the general method of carrying on the *medico-legal* examination of a body.

In cases where a person is found dead, the body should be carefully inspected for external wounds or marks of contusions. Any wound, however minute, should be traced with a probe, and followed to its termination by the knife. Blackish marks should be cut into, in order to ascertain whether they be the effect of the effusion of coagulated blood or merely the consequences of that infiltration of the skin which takes place in the depending parts of bodies after death. The first is termed *ecchymosis;* the latter may be distinguished from the former by the name of *sugillation.* In the subsequent examination of the head, the hair should be removed, the scalp inspected, and afterwards divided from ear to ear, over the vertex; the skull-cap removed; the state of the brain and its membranes carefully marked, and especially any unusual appearances noted down. All should, on the spot, be committed to writing—nothing trusted to the memory, however tenacious. The inspection of the larynx, trachea, and gullet, is best performed by making a cut through the lower lip, and down the fore part of the neck and chest, to the xiphoid cartilage. Transverse cuts should then be extended from the longitudinal one, along the edges of the lower jaw and the collar bones, so as to enable us to turn back the integuments of the neck. The symphysis of the chin should then be sawed through, and the soft parts divided. We can thus separate the two sides of the lower jaw. When the tongue is pulled forward, the fauces and upper part of the œsophagus and larynx are freely exposed, and the introduction of acrid poisons, or of foreign bodies, may often be thus detected. The state of the cartilages of the larynx and trachea should be noted, as fracture or displacement of these has occasionally detected strangulation. A ligature should be put on the lower part of the gullet, and the tube divided above the ligature.

The abdomen may next be opened, by a cut through the skin from the sternum to the pubes. In new-born infants the whole skin and abdominal muscles may at once be cut through, along the cartilages of the ribs on each side, and thence to the anterior edge of the ilium, curving downward to the pubes. This will, when the flap thus formed is turned down, expose the abdominal viscera sufficiently, without disturbing the vessels of the umbilical cord. In the adult, we may first separate the skin of the abdomen from the muscles, in one line from the sternum to the pubes, and, as it is easily extensile, cut out a flap of the muscles of the abdomen as above directed, so as to expose the viscera. The skin so divided makes a neater appearance when sewed up, than when the muscles and skin are divided together, as recommended in the infant. A ligature should be put on the duodenum, and division of the intestines made below the ligature; so that we may remove the stomach and its contents, and reserve them for subsequent examination. The other viscera should also be carefully inspected. The thorax should be last examined; because this enables us better to ascertain the descent of the diaphragm, and the arching of the chest, which takes place in asphyxia, than when we open the chest before the abdomen. The cartilages of the ribs should be divided as close as possible to the ends of the ribs, as thus a larger opening is made in the chest. The position and appearance of the lungs and heart should be noted, and their engorgement with blood, or the emptiness of the great vessels ascertained. When it is necessary to examine the spinal canal, the body should be laid on a table with the face downwards; an incision is to be made along the whole spine, from the occiput to the sacrum, the integuments are to be separated on each side so as to expose the posterior portion of the vertebræ, which may be divided near the transverse processes by a saw, the *rachitome*, or by cutting plyers. A triangular piece should also be sawed out of the occipital bone at the foramen magnum. This will expose the whole spinal canal.

Homicide may be accomplished by several modes that may sometimes be ascertained by examination of the body.

Death by *Asphyxia* or suffocation may be produced by drowning, by hanging, by strangulation, and by mephitic air.

1. *Drowning* may produce the fatal effect in two very different modes. In some, the suddenness of the shock, or the surprise, instantaneously arrests both the functions of circulation and of respiration: no struggle precedes death. This species of drowning has been justly compared to syncope; and hence has been by Desgranges termed *asphyxia syncopalis.* In others, the circulation goes on for some time after the respiration has been interrupted; the animal struggles, makes vain efforts at inspiration, and portions of air are forced out of the lungs by a convulsive effort of the muscles of respiration. The circulation of unoxygenated blood through the brain seems to act as poison on that delicate organ; and the consequence is diminution of nervous energy over all the body, by which the play of the heart is enfeebled, and the animal soon dies. In this case the brain is usually found congested with dark blood. This state has been aptly termed *asphyxia congestiva.* This difference in the phenomena may account for the great difference perceived in the bodies of drowned persons, and also for the difference in the chances of recovery after submersion. In the first species, pallor of the countenance is remarked, and the features are little altered. In the latter, the face will often appear swelled and livid, the tongue be protruded, the nose and air passages filled with frothy mucus, the brain and right side of the heart gorged with black blood. The body which has been some time immersed is usually pale, the eyes are half open, and the pupils generally much dilated, the chest arched, and the diaphragm pushed down into the abdomen. These last signs are most conspicuous in those who have perished from *asphyxia congestiva.*

In discussing this subject, Marc considers that the congestion may take place either in the lungs or in the brain; and that therefore we may consider drowning to take place in three ways. Devergie has made some valuable observations on drowning in his "Médecine légale," and thinks that it is fatal in five ways;—by simple asphyxia—by syncope—by cerebral commotion—by apoplexy—by a mixture of these causes, in which the functions of the brain, the lungs, and the heart, are simultaneously suspended. He considers that simple asphyxia is marked by the only morbid appearance being froth and water in the trachea and extreme bronchial ramifications. Such cases are rather rare, including not more than one-fourth of all the deaths from drowning. Death by asphyxia, joined with syncope, or with cerebral congestion, is the most usual form, and comprehends five-eighths of all the cases of drowning. This state is marked in general by a little water and froth in the trachea and primary divisions of the bronchi. Death from syncope, from simple cerebral congestion, commotion of the brain, or apoplexy, he considers as very rare, not extending to more than one-eighth of all the deaths from submersion.

This subject has been admirably illustrated by Dr. Samuel Wright, in a Prize Essay "On Drowning."* Dr. Wright recognises four kinds of asphyxia; the common syncopal asphyxia, apoplectic asphyxia, and nervous asphyxia, synonymous with the cerebral commotion of Devergie. He has shown, by well-devised experiments, that, in the first kind, the immediate cause of death is the congestion in the lungs;† in the second, the sudden arrestation of the movements of all the vital organs; in the third, congestion in the brain; and in the fourth, the vital organs appear to be affected through the medium of the nerves. He has added some interesting experiments on the residual air in the lungs of drowned animals.

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* In the Class of Medical Jurisprudence in the University of Edinburgh, 1840, since published.

† [Dr. Williams (Edinb. Med. and Surg. Journ. vol. lxxvii. 1823,) and Dr. Kay, (Physiology and Pathology of Asphyxia. Lond. 1834,) maintain, that the congestion in the lungs is owing to the non-conversion of venous into arterial

When the person has retained his sensibility after falling into the water, the ends of the fingers are often found excoriated by his grasping at any object within his reach; and mud or gravel will often be found lodged below his nails. The blood in drowned persons generally remains fluid. If we find in the stomach water containing any foreign bodies, such as fragments of straws or weeds, similar to those in the water in which the body was found, we may be sure that the person was living when immersed in the water; for no water will enter the stomach after death. These are the principal signs by which we can distinguish the extinction of life by drowning, from the cases in which the person has been thrown into the water after death.

It may, however, be very difficult to distinguish a murder by drowning, from death by accidentally falling into water, or from a suicide. The most material circumstances will be, the marks of struggle near the spot where the body has been immersed, the obstacles in the way, the impressions of the feet of more than one person leading to the water. We must also pay attention to appearances of injuries on the body, which could not have occurred from simply falling into the water; such as marks of strangulation on the neck, or wounds inflicted by deadly instruments.

2. *Hanging* produces most of the internal appearances just described; such as turgescence of the vessels of the head, livor of the face, fluid black blood in the lungs and right side of the heart, protrusion of the tongue, and the nose loaded

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blood, and to the non-adaptation of the radicles of the pulmonary veins for any thing but arterial blood, owing to which causes, stagnation of blood supervenes in the pulmonary radicles, and the passage of the blood from the right to the left side of the heart is prevented. An interesting paper "On the Order of Succession in which the Vital Actions are arrested in Asphyxia;" by Dr. John Reid, is contained in the Edinb. Med. and Surg. Jour. for April, 1841, p. 437.]

with mucus: besides these, we usually find a mark round the neck; and when the person has undergone a public execution, especially when the *drop* is employed, there is often luxation of the neck, and fracture of the *processus dentatus.* Luxation of the neck does not easily take place, unless great violence be perpetrated. Even when the body-snatcher was wont to drag the corpse out of the half-opened grave, by a rope passed round the neck, luxation of the neck was rarely seen in the dissecting-room. Ecchymosis is generally found under the mark of the rope: sometimes this mark is not apparent until some hours after death, but dissection will show the cellular tissue, beneath the rope, dry and compressed. The face is generally less distorted, the eyes less prominent, in those in whom luxation of the neck is produced by the drop, than when the struggle is more protracted. Recovery is hopeless in the first case, but has sometimes followed the asphyxia produced by mere strangulation, which seems to cause a stupor, that is, however, soon fatal, if the person be not speedily relieved.

A person may perish by hanging, either from exclusion of air from the lungs, from luxation of the neck, from injury to the blood-vessels and nerves of the neck, or from congestion of blood in the head and lungs, or from several of these causes combined. Experiment would show, that an animal will die from any thing making strong pressure on the neck, even when it does not prevent the entrance of air into the lungs; and this apparently from injury to the nerves in the neck, which supply the principal vital organs.

In examining the body of a person found suspended by the neck, we must determine whether this be really the mode in which life was extinguished, or whether the body was suspended after death. The absence of the usual marks of hanging, the position of the rope-mark on the neck, the presence of other mortal injuries, the appearance of the rope, are all important objects of consideration. Besides the appearances already noticed in persons hanged, we generally find the lungs distended, the bladder empty, and very frequently the urethra filled with seminal fluid, or that fluid shed on the clothes, and the penis in a state of semi-erection. Some of these become of the utmost importance in the difficult cases, where there is a doubt whether the person was murdered or committed suicide. A suicide will generally have something placed near him, on which he has stood in fastening the rope; and his body and clothes will seldom bear marks of any struggle. We must rely for a solution of the problem on the indications just noticed, and the previous history of the individual. If the individual was of a gloomy disposition; if there be marks of organic disease in the head or chylopoëtic viscera, and if the body do not exhibit marks of a struggle with an assassin, the presumption will be that it is a case of suicide. Such accidental circumstances as indicate a murder rather than a suicide, are well illustrated in the cases of *Barthelemi Pourpre*, and of the Swiss peasant described by Louis.

3. *Strangling* may be accomplished by drawing a rope tightly round the neck, or by forcibly compressing the anterior of the windpipe, after the manner of Burke and his imitators. In the first, the mark round the neck will generally be nearly circular, and not inclined to the ear or occiput. It is in this way that the Turks execute persons of rank, by the *bow-string*. In the latter, marks of fingers will often be perceived on the neck, or a circular depression will be found on the front of the windpipe, and sometimes some of its cartilaginous rings will be broken or displaced. The signs of suffocation will be equally present, as in hanging; but if any mark of the cord be on the lower part of the neck, it cannot be a case of death by hanging.

It has been doubted whether a person could commit suicide by fastening a rope or handkerchief round his own throat; but several such instances are on record. Desgranges mentions two such instances; Mr. Dunlop, the editor of an edition of Beck's work, gives in a note a third; and a fourth occurred in a female prisoner in the jail of Kirkwall in Orkney, in the year 1830.

Suffocation has sometimes occurred from bulky substances sticking in the gullet, and compressing the trachea. Assassination has also been effected on infants, or on feeble individuals, by covering up the mouth and nose. This last mode leaves no external marks of violence, and can scarcely be detected, except by the appearance of suffocation found after death. Suffocation may be caused by irritating substances, introduced into the air-passages, causing such swelling as to close the glottis, or to produce spastic closure of its cover.

4. *Mephitism,* or death from irrespirable gases, often happens accidentally, but is seldom the mode of assassination, except in cases of infanticide; and will be noticed under Toxicology.

Treatment of Asphyxia. Our principal object should be, 1*st,* to renew respiration; 2*dly,* to restore the animal heat; and 3*dly,* to excite the system, by the cautious application of stimuli. The first indication is best fulfilled by artificial insufflation of the lungs. This is best done with the bellows, which, when furnished with a spring valve, may be used to draw off foul air from the respiratory organs, before we inflate the lungs. Even blowing with the mouth into the throat of the sufferer will sometimes renew the action of the lungs, and the play o the heart, when apparently quite suspended.

The second indication is to restore the animal heat. This is best accomplished by placing the body, stripped naked, in a comfortably warm room, with a circulation of pure air; by the assiduous use of warm frictions to the skin; the local application of bags of warm sand, bran, or similar materials; by switching or brushing the soles of the feet and palms of the hands; while insufflation of the lungs is not forgotten. The ingenious method lately proposed by Dr. Dalzel, for expanding the chest by atmospheric pressure, is worthy of notice. The body is enclosed, except the head, in an air-tight box, furnished with an exhausting syringe. These means are far superior to the common practice of immersing the body in tepid water. This is especially the case when the asphyxia has been caused by carbonic acid, or by sulphuretted hydrogen; for there is reason to believe that the skin is not wholly passive on the atmosphere; and animals generally recover quicker from asphyxia, when freely exposed to the air, than when immersed in water.

The utility of stimuli in asphyxia is limited. Diluted stimuli may often be useful, if introduced into the stomach, on returning animation, and injections of wine, ammonia, and spirituous lavements have occasionally been very useful. Such lavements are far preferable to the injection of tobacco smoke, which is too apt to sink the powers of life, already reduced below the healthy standard.

Galvanism will also aid the restoration of the action of the diaphragm, and other muscles of respiration, care being taken not to continue its application too long, or too uninterruptedly. Oxygen gas has also been used, in some cases of asphyxia, with advantage.

VII. Death from Starvation.—Cases may occur where it is important to distinguish this from other modes of the extinction of life. In such cases the cutaneous veins disappear, the skin has become harsh, and has a shrivelled look; the fat has disappeared, and the soft parts are greatly wasted; the gums desert the teeth; the eyes are commonly more or less open and bloodshot; the tongue and fauces are dark and dry; the stomach shrunk, blackish, and ulcerated on its internal surface; the intestines resemble a cord; the gall-bladder is gorged with bile, which stains the intestines to a considerable extent; the heart is wasted, and the great vessels are almost empty; the body exhales a most offensive odour of putridity, even before life is extinct.

The period required to destroy life by inanition is very various, and appears to be shorter in the young and vigorous than in persons of middle life, in men than in women.

Persons who are in a humid atmosphere, or immersed in water, bear want of food better than those who are in a dry air. This was illustrated in the wreck of the Fütteh Islam, an Arab vessel lost in the Indian seas in 1836. A part of the crew were on a raft for eight days, without food or drink of any kind, and yet were not quite exhausted. Miners immured accidentally below ground bear inanition much longer than those who are exposed to a free atmosphere. *John Brown*, a Scottish miner, lived twenty-three days in a coal-mine, without swallowing any thing except chalybeate water sucked through a straw, and was taken out alive. Miners entombed by accident have never been known to feed on the dead bodies of their companions in misfortune, as has often happened to seamen, propably because the mephitism of the air of the mine, in such cases diminishes the general nervous excitability, and thus mitigates the cravings of hunger.

In some comatose diseases, and in persons reduced by previous illness, the life under inanition has occasionally been greatly protracted; and when there has been stupour with occasional intermissions, an astonishingly small quantity of liquid aliment has prolonged life for many weeks, months, or even years. Some of the published cases of *fasting* are apocryphal; but in others, where the quantity of nutriment has been extremely small, the individuals may be considered as in the state of hybernating animals, where the diminished nervous energy renders the waste of the system exceedingly slow. Those who are deprived also of drink perish soonest of inanition; and those who are confined in dry warm air, sooner than those exposed to a moist, cool atmosphere.

VIII. Death from Extremes of Temperature.

1. *From Extremes of Cold.*—After the sensation of tingling in the fingers and toes, exposure to extreme cold is soon fol-

lowed by languor, loss of sensation, and irresistible propensity to sleep, which is so oppressive that even the known fatality of the indulgence while exposed to the cold is insufficient to prevent the sufferer from seeking repose. This was remarkably exemplified in the case of the party of Sir Joseph Banks and Dr. Solander, during an excursion in Terra del Fuego in 1769.* Cold does not seem to produce a painful death. In arctic regions, the best preservatives against extreme cold are, woollen garments next the skin, with furs and dressed leather over them, a free use of warm diluents, and avoiding wine and spirits. This is confirmed by the experience of Dr. Scoresby, of Captains Franklin, Ross, and Parry, in the arctic regions.

2. *From a much increased temperature,* the fatal effects may be *scalding* or *burning,* according to the medium applied. This mode of extinction of life leaves very obvious traces on the body. Sometimes fire has been applied to the body after death, to conceal a murder. This fact suggests the propriety of the medical man examining a scorched body minutely, lest there be wounds on its surface, inflicted during life. If the person has lived some time after the scorching, in general there will be found a ring of inflammation surrounding the eschars; but this only takes place when the burning has not been so severe as to sink the powers of life beyond the capability of reaction. When the redness, however, is found around the eschars, we may be sure that the person lived after the application of the fire; for this redness is a vital process.

An increased temperature may be insufficient to vesicate or destroy the skin, yet may prove fatal; as is well known in what is termed a *coup de soleil.* This is a species of apoplexy, chiefly induced by the direct influence of the sun on the head, and appears to be similar to the effect of the *Khamsin* or *Simoom* of the desert, in some cases; but in many instances, death appears to be produced by congestion of the lungs, resembling what has been called *pulmonary apoplexy,* of which most distressing dyspnœa is the chief symptom.

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* See Cook's First Voyage.

3. *Death from lightning* is not wholly to be attributed to the high temperature, but partly to the impulse or shock instantly affecting the brain, and paralyzing the heart; yet, as the marks of singeing are often observed on the bodies of those killed by lightning, it may be here considered. The skin is sometimes discoloured in stripes or oblong patches; at other times the surface has no mark of injury, but the viscera have been observed more or less affected, and occasionally there is a small perforation of the skin. The blood is described in every case as remaining fluid, and the corpse runs rapidly to putrefaction.

IX. Wounds. The examination of wounds, whether fatal or not, often becomes an important branch of legal medicine. Wounds are usually divided into contusions, lacerations, incisions, stabs, gun-shot, and poisoned wounds. Each kind requires to be minutely examined and described, as they are in approved works on surgery. The degree of danger from each should be familiar to the jurist; and he should recollect that there is scarcely any wound which may not become *incidentally* fatal from improper treatment, or peculiarities in constitution.

Contusions may prove fatal by the extent of the ecchymosis they may occasion, by the injury they inflict on internal organs, or by the high degree of inflammation, and consequent gangrene, to which they give rise. Incisions may cause death by hemorrhage, or by the wounding or dividing of organs essential to the vital functions. Punctured wounds or stabs require minute attention; for there have been instances in which death has been produced by an instrument not thicker than a pin, thrust into the brain, the spinal marrow, or the heart. They are apt to be followed by severer symptoms than cuts, because they often penetrate deeper, give a less free egress to effused blood, or to pus, and sometimes produce contusion, as well as the punctured wound.

Gun-shot wounds are more dangerous than incised wounds, or even than stabs, of the same extent; because they occasion the death of the surrounding parts by the contusion produced, and the greater extent of suppuration to which they give rise. The direction of a ball which has struck an individual cannot always be positively known from the direction of the wound; for very slight resistance has been known to deflect a ball, so as to cause it to describe a curvelinear direction in the body struck. The place of entrance is usually marked by a hole, seemingly smaller than the ball, with *inverted* edges; and the place at which it makes its exit from the limb, is marked by the *everted* edges of the wound. Balls have been lodged in various parts of the human body, even in the chest, or the heart itself, for years, without causing death.*

Poisoned wounds belong to Texicology.

Wounds are more or less dangerous according to their locality.

1. *Wounds of the Head* are always dangerous, especially if the blow has been considerable. The person so wounded may die without separation of the integuments, or fracture of the bone; as happens in what is termed *concussion* of the brain. Contusions which do not divide the skin may fracture the skull; or the inner table of the skull may be fractured without the outer being broken or depressed. Even wounds of the integuments may prove fatal, from inflammation extending inwards to the brain. Punctured wounds of the head are more dangerous than cuts, as more likely to excite fatal inflammation. When the brain or its meninges are injured, all such wounds are generally fatal; though not always so. Portions of brain have even been discharged without causing death.† In all injuries to the head, the supervening of fever after the seventh day, especially if it be attended with acute pain in the head, must

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* Ditionn. des Seienees Médicales. Cas Rares.

† Ambrose Paré, Hildanus, Fallopius, Vicq d'Azyr.

be considered as very unfavourable, and the coming on of delirium, indistinct vision, and deafness, are highly so, as are all derangements of the excretions.

Wounds of the face or organs of sense are often dangerous, and always disfiguring. Malicious disfiguring of the face was made a capital felony in the reign of Charles II., by the *Coventry act;* but the monstrous anomaly pointed out by Filangieri, that disfiguring *with the intent to disfigure* was punished with death, while *the intent to murder* was not capital, no longer disgraces our Criminal Jurisprudence.

Wounds of any of the organs of sense are generally dangerous, and always produce serious inconvenience. Wounds of the eyes are highly dangerous, not only because of the injury to vision, but on account of the proximity of those organs to the brain, and the risk of inflammation extending inwards. Yet very severe wounds of the eyes have been received, even by large foreign bodies being lodged for some time in the orbit, without destroying life. A blacksmith, still living in Ayrshire, had the breech and tail-piece of a gun lodged in his eye for upwards of ten months. It weighed 1011 grains. Wounds of the nose are dangerous, from the risk of inflammation reaching to the brain. Contusions on the nose have produced death, or have ended in incurable *Ozæna.* Wounds of the external ear have sometimes produced dangerous erysipelas.

2. *Wounds of the Neck* are always very serious, wherever more than the integument is divided. The danger of opening large blood-vessels, or injuring important nerves, is imminent; even the division of a considerable vein in the neck has proved immediately fatal, from the entrance of air into the vessel, and its speedy conveyance to the heart. A blow on the side of the neck has instantly proved fatal, either from the blood being forced back into the brain, or from injury to the superior parts of the par vagum, the great sympathetic, and the other cervical nerves. An instance occurred in 1838, in Liverpool, in which a blow with the naked fist, entirely divided the external carotid artery in a healthy man, who died very speedily.

Wounds completely dividing the trachea are generally mortal, from bronchial inflammation. Dislocations and fractures of the bones of the neck usually prove instantly fatal. Dislocation of the neck is most usually between the atlas and second vertebra, in which case the processus dentatus is broken in adults; but in children, in whom this process is imperfectly developed, dislocation may take place without fracture. It requires, however, much violence to fracture this pivot of the head, or to dislocate the vertebræ, unless there be disease of the bones. There is one instance of a man living nineteen days after fracture of the bodies of the six lower cervical vertebræ.*

3. *Wounds of the Chest* are always serious, when the cavity is penetrated, though persons have recovered from wounds of the lungs, and have even survived for some time considerable wounds of the heart. The last is an important fact; because we are not always to consider the spot where the body of a person killed by a wound of the heart, and apparently remaining where he fell, is found, as that in which the death-wound was inflicted. Instances have occurred of persons surviving severe wounds of the heart for several days. Cases of this kind are given by Triller,† by Featherstone,‡ by Fuge,§ by Dupuytren,|| by the authors of "Dictionn. des Sciences Méd." In Mr. Dawson's remarkable case at Liverpool, the ventricle was twice perforated, as was the stomach, by a pitchfork; yet the boy lived twelve hours and a half after the injury. Fractured ribs are never without danger; and the same may be said of severe contusions of the chest, from the chance of inflammation extending inwards. Wounds penetrating both sides of the chest are generally considered as fatal, though animals have recovered after having both sides of the thorax penetrated, and the wounds kept open for some minutes.

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* Mémoires de l'Académie de Chirurgie.

† Schlegel Coll. tom. v.

‡ In Medico-Chirurg. Trans. ii.

§ In Edin. Med. and Surg. Journ. xiv.

|| Sur les Blessures, i.

4. *Wounds of the Abdomen,* when they do not completely penetrate, may be considered as simple wounds, unless when inflicted with great force, so as to bruise the contents of the cavity; in that case, they may produce death without breach of surface, as sometimes happens from blows or kicks on the belly. Wounds injuring the general peritoneum, or that duplicature of it investing the stomach and intestines, are highly perilous, from the risk of severe inflammation. Wounds of the stomach or intestines, or of the gall-bladder, generally prove mortal, from the effusion of their contents into the general cavity speedily producing fatal inflammation. Wounds of the liver, spleen, or kidneys, are generally soon mortal,* from the great vascularity of these organs. In wounds of the kidneys, which open into its pelvis, there is imminent hazard, too, from the effusion of so acrid a fluid as the urine. The same cause renders wounds of the urinary-bladder extremely perilous; yet there are instances of persons recovering, through whose bladder musket-balls have passed.† Rupture of the bladder by a fall or a blow soon terminates fatally, from the high degree of inflammation excited. If a calculus be contained in the kidney or the bladder, a blow on the region of either may speedily be fatal, from the same cause. Wounds of the uterus are always perilous, and may be known by the direction of the wound, by pains in the loins stretching to the groins, followed by fever and inflammation, sometimes by delirium and convulsions. When the wound has penetrated into its cavity, blood has been discharged by the vagina, and unconnected with the natural discharges.

Effusion of blood into the general cavity of the abdomen is almost the only effusion, the immediate consequence of a wound, which will not soon be fatal.

5. *Wounds of the Extremities,* when fatal, may generally be considered so from excessive hemorrhage, from the consequences of inflammation and gangrene, or from the shock to the

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* [The exceptions, however, in cases of wounds of the spleen are numerous.]

† Case by Mr. Douglas, in Edin. Med. and Surg. Journ. xiii.

system, when large portions of the limb are forcibly removed, as in accidents from machinery, and in wounds from fire-arms. Wounds of tendinous parts, especially about the thumbs and great toes, are apt to end in tetanus. This disease is much more frequent in hot climates than in Great Britain, and is generally fatal. Compound or comminuted fractures of bones in the extremities, or fractures laying open the joints, are always to be considered as very serious accidents, which may terminate fatally. Our prognosis must depend on the nature of the injury, and the constitution of the patient. They often demand amputation; but, since the late Mr. Park of Liverpool introduced excision of diseased joints, we have numerous instances of this operation saving the limb. The complete division of the smaller joints, and of portions of the nose, followed by reunion of these parts when speedily brought into apposition, ought to be recollected by the medical jurist, as the fact may bear on some questions as to personal identity, which may also be affected by the operations of *rhinoplasty*, or restorations of the nose, restorations of the lips, &c., on the plans practised by the natives of India, by Taliacozzi and other Italians, by Carpue, and by Dieffenbach.*

6. *Detection of spots of blood.* In cases of murder, it is sometimes important to distinguish stains of blood on the clothes, or on a deadly weapon, from those produced by some vegetable dye, or by rust. If the garment has *directly* received the blood, we shall find on the cloth remains of fibrine, as well as of the serum and colouring matter of the blood. The best method of examining such is—

a. To take an oblong slip of the stained article, and suspend it vertically for some hours in a narrow jar of distilled water. The water will separate the albuminous part and colouring matter of the blood, which will subside to the bottom of the fluid. The fibrine will remain on the cloth, as a gelatinous body, and may be scraped off for examination. Dry the fibrine, and heat a portion of it in a tube, when it will give out the odour of burning animal matter, and ammonia will be disengaged, which becomes sensible to the sense of smell, or will affect test-paper introduced into the upper part of the tube.

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* Taliacotius de Curtorum Chirurgiâ. Bonn. 1594. Dieffenbach. Berlin. 1829. Labat, Rhinoplastie. Paris, 1834. Bengal Hircarrah, 1794. Edin. Med. and Surg. Journ. xxviii. and xxxiii.

b. Draw off the colourless fluid, by the pipette, from the coloured portion in the bottom of the glass, and divide this latter into five portions. If the stain has arisen from blood, it will give the following indications:—A weak solution of chlorine added to one part, will first make it faintly greenish, next colourless, afterwards opalescent, and then whitish flakes will be deposited; to a second portion add a drop or two of ammonia, which will not change the colour of blood; but if the colour be produced by Brazil-wood, logwood, or the like, ammonia gives them a violet tint. Infusion of galls throws down a precipitate, without changing the colour of the blood. A few drops of nitric acid throw down a grayish-white precipitate from blood.

If the blood has oozed through the first garment, and stained an exterior one, the stains may be treated as above, but the fibrine will probably be only found on the interior garment. If blood has incrusted a knife or other cutting instrument, by gently heating one part of the blade, the stain will scale off, leaving the metal uncorroded below; but a stain from the rust will not thus form a crust, nor will the surface be clean. These scales may be tested for ammonia in a heated tube. It would appear, however, that sometimes rust of iron gives slight traces of ammonia, probably from the action of moist air on the iron; but there is small danger of confounding this with the more decided indications of blood so treated; and, besides, the knife may be treated in the same manner as the slips of cloth, and the tests applied to the liquid. Stains of blood on wood are apt to sink into it, especially when it is soft, but it may be detected by a similar process, in many cases.

X. Toxicology.—This most important branch of legal medicine has been more thoroughly investigated than any other part of Medical Jurisprudence.* A poison may be defined *a substance capable of impairing or extinguishing the vital functions, in a great majority of cases.* This limitation is necessary, because some of the most deadly substances, in small doses, may be taken not only with impunity, but with salutary effects; and habit renders doses of them innocuous, which would destroy an individual unaccustomed to their use. Thus, the Turks, Persians, and some other eastern nations, use opium in quantities that would kill persons unaccustomed to the drug. Habit had rendered the Turk, mentioned by Pouqueville and Hobhouse, so insensible to the action of corrosive sublimate, that he often took as much as a drachm for a dose. Some poisons act directly on the organs to which they are applied; others appear to act by their influence on the nervous system. Some appear to act merely as irritants or escharotics; others by directly impairing vital functions; and some have a twofold action. The manner in which poisons affect the system appears to be either through their direct influence on the extremities of the nerves to which they are applied, or by absorption, and consquently by the circulating fluids. The rapidity with which some poisons, as hydrocyanic acid, act, favours the opinion that their influence is instantaneously conveyed to the vital organs by nervous communication. The detection of poisons, in some instances, in the blood, or in the exhalations or secretions, favours the opinion of the circulation being one channel by which they are carried to the system; a fact which is farther confirmed, by the effect of ligature or of division of vessels, in preventing the constitutional affection of inserted poisons on the system. Some poisons exert their deleterious influence on one organ, or set of organs; others generally affect the system. Poisons, classed according to their effects, may be divided into *irritants, narcotics, narcotico-acrids,* and *septics.* Their action is modified by the tissue to which they are applied, the constitution of the individual, the quantity of the poison, and its mechanical state.

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* Particularly by Orfila, Christison, Buchner, and Devergie.

The tissue most susceptible of the action of poisons is the serous; and the lungs, which partake of the nature of both a mucous and a serous tissue, when the poison is in the state of vapour, are especially so. Idiosyncrasy or peculiarity of constitution, will render substances innocent to one, poisonous to another; and some individuals can with impunity take a quantity of some substances which would be deleterious to most persons. This is often the consequence of habit, as is instanced in chewing and smoking tobacco, in the use of opium, or in the curious case of "Solyman Yeymin" above mentioned. A poison will operate more quickly if finely pounded, than when in masses, and still more so if in solution, by which its chance of absorption, or of being spread over a larger surface, will be increased.

The mode of treatment of poisoned persons depends on the nature of the poison. The first indication is undoubtedly to evacuate the poison as speedily as possible, by the stomach-pump or by emetics; the second, to administer antidotes, if any such be known for the particular poison; the third to shield the stomach and *primæ viæ* against the acrimony of the substance; and, lastly, to obviate any violent or untoward symptoms they may produce, by all the resources of our art.

When a poison is inserted into a wound, a ligature between the wound and the heart will often arrest its effects on the system; and if the part affected be sucked, or have the cupping-glass applied, the whole of the poison may thus be removed. In this way the effects of a poisoned wound, the bite of a rabid animal, or of a snake, may be entirely obviated, as was well known to Celsus,* though claimed by a modern author as a suggestion of his own.

The ancients believed in general antidotes against poisons, which rendered an individual using them proof against every kind of poison. There are no such substances. But in the instance of some particular poisons, substances capable of decomposing them, or of forming with them insoluble and inert compounds, if speedily administered, are antidotes against that particular poison.

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* See Lib. v. cap. 17. 1. 2.

The evidence of poisoning may be presumptive or positive, physical or moral. The physical proofs are derived from the symptoms, from experiments on the lower animals, and from a chemical investigation of the *ingesta* or *egesta*. The symptoms, however, only supply us with probable evidence; but the most important inferences they afford are deduced from the simultaneous occurrence of similar symptoms, in more than one individual previously in good health, soon after a meal on the same articles of diet. Experiments on the lower animals with the remains of the ingesta, or portions of egesta, are not much to be relied on, as all animals are not equally susceptible of the same poisons; and what is deleterious to one is innocuous to another. Some poisons, however, such as arsenic and corrosive sublimate, are equally poisonous to all. Such experiments we consider as scarcely justifiable, except in the cases of some vegetable poisons, which cannot otherwise be readily detected. The evidence from chemical analysis of the stomach, of the ingesta or of the egesta, is the most unexceptionable. The refinements of modern chemistry have enabled us to detect surprisingly minute quantities of inorganic poisons, and even of some vegetable poisons. In such investigations, the contents of the stomach, or egesta, should be put into clean vessels; if too thick, diluted with distilled water, boiled, and when cold, filtered through muslin, and then through paper. If the filtered liquor contain much animal matter, this must be separated, as it obscures the various tests to be applied. This in general is best done by acidulating the liquor with vinegar, by again boiling and filtering. Sometimes it requires to be farther clarified, by the addition of animal charcoal, or of nitrate of silver, which separate all the animal or vegetable matter. To portions of the clear and colourless liquid thus obtained, various tests are applied, the effects of which will decide the nature of the poison. Sometimes the whole poison may have been evacuated by vomiting, or taken up by absorption, that no trace remains in the contents of the stomach. In this case we can occasionally detect it, by cutting the stomach into pieces, boiling them in distilled water, purifying the liquid by some of the processes already described, and then applying the tests. Narcotic poisons are easiest detected by their smell; sometimes we can eliminate one or more of their peculiar ingredients by chemical means, but frequently we have no better means of detecting them than by the symptoms they produce, and the moral evidence of the case, or the morbid appearances on the body after death.

We are not to regard the livid appearance of the body as evidence of poisoning; it is not always present in cases of poisoning, and may arise from other causes. The rapid putrefaction of the body is as fallacious an indication. The very reverse is sometimes the fact. The classes of irritant and narcotico-acrid poisons are usually indicated by inflammatory appearances in the primæ viæ, but these are not invariably present; and cases often occur of which the moral evidence may be strong, yet the direct evidence may amount to no more than a probability.

The moral evidence of poisoning may sometimes be best collected by the medical attendant. He may be the only witness of the conduct of the accused; he may have observed him suspiciously active in removing every trace of the potion administered, or of the egesta in which a poison might be detected; he may have observed the guilty confusion of the suspected person, or heard his attempts to explain a fatal mistake, if the administration has been traced to him; or the physician may have been the chief depositary of the dying declaration of the sufferer. All these circumstances it is his duty to note down, and to communicate to the proper authorities.

The declaration of the individual will be received as evidence in such cases, without the sanction of an oath, provided he were sensible that he was in danger of dying at the time of emitting it; but if there be an opportunity, it is best that such declaration be made to a magistrate, or to some official person. The medical man should be able to certify that the person was at the time of sound mind.

Poisons may be divided into, 1*st*, Irritants; 2*d*, Narcotics; 3*d*, Narcotico-acrids; 4*th*, Septics. The first class inflame, sometimes corrode the surfaces to which they are applied. Some of them have also another effect on their absorption, producing a specific action on the heart, or some other vital organ. Some of them are chemical agents of great activity; others are derived from the vegetable kingdom.

The second class produce a species of intoxication, drowsiness, and stupor, paralysis, or convulsions. Opium, and the plants yielding hydrocyanic acid, are the chief poisons of this class.

The third class includes mushroom poison, strychnia, camphor, belladonna, digitalis, &c.

The septic class consists of animal poisons, such as bites of snakes, stings of insects, bites of rabid animals, and the effects of the pestilential carbuncle.

Poisons are derived from the inorganic or organized kingdoms of nature. The first may be metallic, earthy, alkaline, simple chemical substances, and gaseous bodies: the second vegetable and animal poisons.

I. METALLIC POISONS.—Of these, arsenic, quicksilver, copper, lead, antimony, zinc, tin, bismuth, chrome, silver, gold, are the most important.

1. *Arsenic* is poisonous in all its combinations. Its most usual preparations administered as poisons are, the blackish oxide or fly powder, the white oxide or arsenious acid, the sulphurets, and the combinations of arsenious and arsenic acids with alkalies. All are very deadly, even in small doses, whether swallowed, introduced into the anus or the vagina; applied

to the abraded surface, or even when extensively applied to the whole skin.

Of these white arsenic, or arsenious acid, is the chief. It is obtained in roasting ores of various metals, and is purified by distillation. It forms a translucent mass when recently distilled, but becomes opaque by keeping. The opaque is more soluble than the translucent variety. Water at the boiling point, takes up one-ninth of its weight of the first, and one-tenth of the second; but, as the solutions cool, they deposite small crystals, and not more than about one-thirty-fourth part of the weight of the water remains in solution; so that each fluid-ounce of the liquid will not contain more than 14 grains of this substance. But even this solubility is greatly diminished by the presence of most animal fluids, especially of serum or milk; and even by many vegetable infusions, such as tea, and other astringents. White arsenic is nearly tasteless, when first applied to the tongue; it is easily volatilized; and if the process be slowly performed, it may be obtained in octohedral crystals. According to Berzelius, it consists of M 100 + O 31.90. It combines with alkalies into uncrystallizable compounds, which are much more soluble than arsenious acid.

Arsenic combines with more oxygen to form arsenic acid. It consists of 100 M + 53.18 oxygen. It unites with the alkalis: the arseniates of potassa and soda are not crystallizable, though that of ammonia is so; but the biarseniates of potassa and soda readily form crystals.

These alkaline compounds are all highly poisonous; but only one, the arsenite of potassa, is likely to fall under the cognizance of the toxicologist. This last is used in medicine, and is well known under the name of *Fowler's solution*. Arsenic combines with sulphur in five definite proportions; only three of these are important.

Realgar, the *Hyparsenious sulphide*, of Berzelius, is found native, and is largely manufactured for the purposes of the dyer, by fusing together sulphur and arsenious acid; its colour is aurora-red; it consists of M 100 + S 42.85. *Orpiment,* or *Arsenious sulphide,* occurs native, but is made largely by precipitating solutions of white arsenic in hydrochloric acid by sulphuretted hydrogen; it consists of M 100 + S 64.27. A less pure orpiment is found in the shops, which is formed by subliming a mixture of sulphur and arsenious acid. It often contains between its layers small crystals of the latter.* Another precipitated sulphuret, the *Arsenical sulphide* of Berzelius, is formed by precipitating arsenious acid by sulphuretted hydrogen; it consists of M 100 + S 51.69. A supersulphuret may be obtained by adding alcohol to a sulph-arseniate of potassa or soda. The liquid obtained on evaporation deposites brilliant yellow scales, which consists of M 100 + S 385.20. A subsulphuret is formed by boiling realgar with caustic potassa; its colour is deep brown; its composition is M 100 + S 3.56.

White arsenic unites with the oxides of various metals; but only two or toxicologically important, the arsenites of copper and of silver; both of which form delicate tests of arsenic, when thrown down by the ammoniaco-sulphate of copper and ammoniaco-nitrate of silver.

The symptoms commence usually within an hour after the administration; and are, nausea, vomiting, great heat and pain in the stomach, purging, intense thirst, severe spasms in the limbs and body, prostration of strength, pallor of the face, a feeble pulse; sometimes convulsions precede death. In a few cases the symptoms of an irritant poison are wanting, and the arsenic appears to be fatal by immediately inducing paralysis of the heart.

White arsenic would probably be fatal in a dose of 5 to 10 grains; but in most instances of poisoning by this substance, it is given in much larger doses. Half that quantity administered in solution, has been fatal to an adult.†

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* Guibourt, Jour. de Chim. ii.

† Alberti, t. v. Rust. Magazin, t. xx.

The fauces, gullet, and stomach, are often found marked by inflamed patches of a deep vinaceous colour, produced by blood effused under the inner coats of these organs. Sometimes the villous coat appears corroded or thickened, but the stomach is seldom perforated. When the villous coat has suffered erosion, the poison has generally been given in the solid form, and grains of it may often be picked off the surface of the stomach for analysis. The inflammation seldom reaches to the jejunum; but, though the greatest portion of the small intestines and the colon escape, marks of irritation are often observed about the rectum, especially if the purging has been violent. Inflammation of the stomach also occurs in cases where the poison has been injected into the bowels, applied to a wound, or to the lungs in the state of vapour. In no form is this poison more deadly than when received into the lungs as arseniuretted hydrogen. This proved fatal to Gehlen, the celebrated chemist, and to Beard, a young British lecturer on chemistry. Persons have been poisoned by enemata containing arsenic; there are instances of speedy death following its introduction into the vagina, and the symptoms are nearly the same as when arsenic is swallowed. The bodies of those who perish from arsenic, have been found long uncorrupted; and the stomach and intestines are usually undecayed, even after being buried for many months. I found a foreign seaman's body, very little changed, except the head and neck, after he had been for more than five months in the grave, and the stomach and bowels seemed as fresh as those parts are usually seen in a dissecting-room. In this case the stomach contained much arsenic. At Bristol, a stomach imbued with this poison was examined, and could be tied and handled, after being fourteen months buried. In Archives Générales de Médecine, is reported a case that occurred in France, in which Ozanam and Idt detected arsenic, after the body had lain buried in a dry sandy soil for seven years.

Various antidotes have been proposed, such as charcoal and magnesia; but the only substance that seems to deserve any reputation, is the recently prepared *hydrated peroxide of iron*, promptly administered in large doses. Magnesia and charcoal seem only to act mechanically; for at the temperature of the human body, they do not affect arsenious acid. Oxides of iron were first proposed by Navier; but his conclusions were said not to be correct. Yet, more lately, Drs. Bunsen and Berthold of Göttingen have shown that the hydrated peroxide, as precipitated by ammonia, is really a powerful means of obviating the poisonous effects of arsenious acid. This has been since confirmed by Soubeiran, Miquel and Orfila.* This antidote is best prepared by mixing, with a solution of common sulphate of iron, rather more nitric acid than there is sulphuric acid in the sulphate, and boiling the mixture as long as red fumes are given out; then precipitating by ammonia, and slightly washing the precipitate; which should be kept in a moist state for use.

I find that this will precipitate the whole arsenic from a solution of arsenious acid, especially if recently prepared, and if it contain a little ammonia. This last ingredient seems to enter into the combination; for I always obtained it from the arsenite of iron so thrown down. Arsenite of iron is decomposed by free acids; the hydrochloric acid in the stomach may thus act, if some alkaline matter be not also present, and therefore it may be advisable to administer a little magnesia along with the peroxide of iron.

The means of detection, when the arsenic is solid, are easy. Introducing it—with charcoal powder if it be white arsenic, or with black flux, if it be orpiment—into a small tube, and applying gradually the heat of a spirit lamp, will afford a blackish shining metallic crust, the interior surface of which is crystalline. A portion of this, exposed to heat, exhales as a white smoke, and gives out an alliaceous odour. Another portion, slowly heated in a tube, open at both ends, is converted into minute tetrahedral crystals. When it exists in solution in the contents of the stomach, we have to clarify the liquid, and to apply tests; of which the most approved are a stream of sulphuretted hydrogen, which throws down a lively yellow precipitate; the ammoniaco-nitrate of silver, which gives a yellow precipitate, that soon fades to a brown; ammoniaco-sulphate of copper, which gives a green precipitate. Either of these precipitates heated with black or soda flux, in a glass tube, will afford the crust already described. Lime water throws down a copious white precipitate. This is the process employed by Rose, of Berlin, and is very delicate; but the colour is not characteristic, and it might be confounded with the tartrate or phosphate of lime, unless the precipitate be reduced by boracic acid and the application of heat. The ammoniaco-nitrate of silver, and ammoniaco-sulphate of copper, require the liquid to be neutral before their application; and animal and vegetable matters greatly impede, or absolutely prevent, the formation of the metallic crust. The precipitation of the arsenic by sulphuretted hydrogen, is a very convenient test, because the product is bulky and coloured. Before it is used, however, the contents of the stomach, or suspected liquid, should be first acidulated with acetic acid, then boiled and filtered. This will separate the greatest part of the organic matters, and if the liquid be nearly colourless and clear, we may at once pass the stream of gas through it.* These indications leave no doubt of the presence of arsenic; and from the $\frac{1}{250}$ or $\frac{1}{300}$ of a grain may be converted into a sensible metallic crust.

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* [The author might have ddaed the names of Boulet, Chevalier, Lassaigne, Nonat, Borelli, Demaria, Leuseur, Boulay fils, Monod, Von Specs, and Mackenzie. The hydrated peroxide has been given in many cases with success both in Europe and in this country. (See Dunglison's New Remedies, art. Ferri Oxydum Hydratum, 3d edit. p. 269. Philad. 1841.)

Instead of the pure hydrated peroxide, Von Specs employed substances in which the peroxide is known to exist in considerable quantity, and which require no previous preparation—as rust of iron and hæmatite, and from his experiments he was led to conclude, that, although these substances do not prevent all the bad effects of arsenic on the system, they may—in the absence of the hydrated peroxide—be employed as antidotes to that poison.]

The only other metal which gives a yellow precipitate with sulphuretted hydrogen is cadmium; but this metal is very rare, and is very little likely to be found in the human stomach in appreciable quantity. Should it be, sulphuret of cadmium is not volatile; it becomes red when heated, and again yellow when cold; characters sufficient to distinguish it from sulphuret of arsenic. But we have still a more decided test in the reduction of arsenic to the metallic state, the odour of the metal when heated, and its easy conversion into arsenious acid, by heat and contact with air. In no instance should we depend merely on the colour of precipitates, which may be altered by several adventitious circumstances; but reduction to the metallic state should always be attempted in judicial examinations.

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* Christison on Poisons, ed. 3d. 258; and in Edin. Med. and Surg. Journal, vol. xxii.

Other modes of detecting arsenic have been proposed. Jäger, Fischer, and Torosovitz, have proposed to separate arsenic from the contents of the stomach by means of galvanism. In 1833, I made use of the following contrivance. I acidulated the suspected fluid with diluted sulphuric acid, and introduced into it a slip of zinc, round one end of which was some gold leaf; a galvanic action commences, and after some hours, metallic arsenic is deposited on the metals as a dark stain; on drying the metals, and introducing them into a tube, the application of heat affords the alliaceous odour. In Marsh's elegant apparatus, arseniuretted hydrogen is formed: the suspected liquid is introduced into a syphon-tube, one end of which is shut by a stop-cock with a capillary bore. The fluid is acidulated with sulphuric acid, and a piece of pure zinc is introduced before the stop-cock is fixed to the short leg of the syphon; the nascent hydrogen decomposes the salt of arsenic in the liquid, unites with the metal to form arseniuretted hydrogen, which gradually fills the short limb of the syphon; on opening the cock, this gas is fired, and over its flame is suspended a piece of porcelain, on which a black crust of arsenic condenses, with a strong odour of garlic. Antimonial salts thus treated, give a similar crust, but without this smell; the crust of antimony is not so easily raised as arsenic in white vapour, and does not again condense in a crystalline form. It is necessary, however, that the materials and apparatus be absolutely free from arsenic, except what may be in the suspected liquid. I also find that, after using the apparatus several times with arsenical solutions, so much arsenic is deposited on the inside of the stop-cock, that it will afford indications of that metal with distilled water, pure acid, and pure zinc, for more than twenty trials. I found it absolutely necessary, therefore, to heat the stop-cock, before I could get free of the whole arsenic. This is a very important fact, and shows the precautions we should employ in applying this test to suspected cases of poisoning.

2. *Mercury or Quicksilver.*—Mercury is fluid until the temperature falls to –40°, which is its melting point. When solid, its sp. gr. = 15.612; at tem. 50°, it is 13.345; it boils at 662° F. This metal in its pure state has been supposed innocent; but when in the state of vapour readily enters the system through the lungs, and then may be fatal. When applied in its ordinary state to the skin, it is inert; when swallowed, it is seemingly quite inactive, unless it become oxidized in the stomach or bowels, and then it is capable of producing all the effect of mercurial poison.* The most usual mercurial poisons are corrosive sublimate or bichloride of mercury, its oxides, and sub-salts. The long-continued use of calomel is capable also of acting as a poison; but almost the only mercurial poison criminally administered, is corrosive sublimate, though, from its detestable taste it cannot be given by the mouth as a secret poison.

Corrosive sublimate may be known from its taste, its solubility, and becoming yellowish from mixture with fixed caustic alkalis and lime water. These characters distinguish it from calomel, which is blackened by all the alkalis, and is highly insoluble and tasteless. Ammonia does not change the colour of corrosive sublimate. Hydriodate of potass precipitates it of a rich crimson, and protumuriate of tin of a slate gray. A very weak solution becomes first whitish, from a stream of sulphuretted hydrogen, and then blackish. These characters sufficiently discriminate this active poison.

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* Dr. Wright's Inaug. Dissertation, 1840.

The usual indications are a most disagreeable styptic taste, then burning of the throat, violent vomiting, great distress in the stomach and bowels, violent colic and severe purging, blood mingled with the matter brought up by vomiting, or ejected by stool. The symptoms often simulate dysentery; the face at first is often flushed, the eyes sparkling; soon the powers of life sink, the voice is lost; cold clammy sweats bedew the surface; perception of external objects is lost, and convulsions close the scene. When the substance is given in small doses, or if the mercurial be a milder preparation, after dysenteric symptoms ptyalism supervenes; the person may sink from the violence of that affection, the fauces may become ulcerated, and gangrene may ensue. If ptyalism follow the administration of a single large dose of mercurial, it is always to be regarded as a formidable symptom. When the person survives, he may suffer from mercurial palsy.

Ptyalism may arise spontaneously, or from the exhibition of various remedies, such as nitric acid, preparations of copper, antimony, digitalis. In these cases it appears that the chief diagnostic is the absence of the peculiar fœtor of the breath, which is constant in the mercurial ptyalism. Mercurial ptyalism occasionally has intermissions, or considerable intervals, extending from a few days to six or seven months. The importance of this fact, in a medico-legal sense, is illustrated by the trial of Mary Butterfield for the murder of Mr. Scawen.*

The effects of mercurial poisons are indicated after death by the following appearances. The fauces are generally more affected than from arsenic, and the inflammatory appearances are more diffused over the alimentary canal. Destruction of the coats of the stomach is often observed, either the consequence of the escharotic power of corrosive sublimate, or of ulceration.

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* Trial, 1775.

Peritoneal inflammation is not uncommon; and irritation of the urinary organs, perceived during life, is marked by inflammatory indications found after death.

We possess in whites of eggs, milk, and gluten of wheat, antidotes of considerable power against the poison of corrosive sublimate, provided they be given soon after the poison. The first is the most powerful. The secondary symptoms must be met by antiphlogistic remedies and venesection. The albumen of eggs was first proposed as an antidote for corrosive sublimate by Orfila, who published several cases of its efficacy; and a remarkable one is given by Dr. Lendrick;* but Dr. S. Wright has lately shown that, unless the albumen be fresh, and unless it be in due quantity, it does not act as an antidote. He shows, also, that its efficacy is much increased by giving with it some vegetable infusion containing tannin.† Taddei, of Florence, proposed vegetable gluten as an antidote for corrosive sublimate, which he rubbed up with eight times its weight of soap. This last ingredient probably aids the effect of the gluten in decomposing the bichloride; but this remedy is found to be less effectual than the albumen of the egg.

Mercurial poisons are easily detected when we obtain them in substance, but not so readily when mingled with the contents of the stomach. Corrosive sublimate is decomposed by several animal substances, and therefore we are not likely to detect it unchanged in the contents of the stomach. It is there usually converted into calomel, either in whole or in part. When held in solution, it is easily detected by Sylvester's method, *i. e.* by dropping a little of the suspected liquid, slightly acidulated, on a gold plate, or a gilt card, and touching the gold surface, through the liquid, with a piece of zinc or iron wire. I employ a similar method to separate the mercury from its solution. I wrap a gold leaf round a slip of zinc, and immerse it in the suspected liquor, slightly acidulated; the mercury is precipitated; and scraping off the gold and the tarnished surface of the zinc, I introduce them into a small tube, when the heat of the spirit lamp is sufficient to produce a ring of brilliant metallic globules.

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* Trans. Dublin Coll. Phys. iii.

† Wright's Inaug. Dissert.

In all probability the mercurial will not be found in the stomach in a soluble state. The probable contents of the human stomach, many vegetable, most animal fluids, and even the contact of animal tissues, are capable of decomposing the bichloride, and converting it into protochloride. Hence, though the poison administered be corrosive sublimate, none of that salt may exist in the stomach after death, and all the mercurial there may be in an insoluble state, intimately mingled with the contents of the stomach. Sometimes it exists in the clots of blood found in the stomach, or adherent to the eschars there produced by the poison. In such cases, the clot or eschar should be removed, and boiled with caustic potassa, when the animal matter will be dissolved, and the mercurial will be found as a grayish powder at the bottom of the vessel. It may be separated by decantation, or the pipette, washed, dried, and will afford metallic globules, when heated in a tube.

When the quantity is very minute, we may use the process of Devergie.* In this case we have to form the contents of the stomach into a pulp, to boil it with a little hydrochloric acid, to reduce it to the consistence of thin gruel, by successive additions of distilled water, and to pass a stream of chlorine through the mass, when the mercurial present will be converted into bichloride, which may be separated by filtration; drive off the excess of chlorine by boiling the liquid, and then either precipitate the mercury, by introducing into the liquid a cylinder of pure tin, according to Devergie's method, or by my combination of zinc and gold leaf. The tarnished surface of the metals in either case is to be scraped, and the powder so obtained introduced into the tube and heated, as already described. If precipitation by a liquid re-agent be preferred, there is none superior to the addition of protochloride of tin to the liquor obtained by the above process, which will precipitate any mercurial present as a protoxide, or in the metallic state; and when washed, the precipitate will afford bright globules by heating it in a tube. The solid mercurials are easily reduced to the metallic state. Red precipitate is reduced by merely heating it in a tube. The sulphurets and chlorides, as well as the sulphates and nitrates of mercury, when mixed with carbonate of soda, and treated in the same way, afford metallic mercury. The cyanide of mercury, when thus heated, affords *cyanogene*, which burns with a rose-coloured flame.

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* Devergie, Médecine Légale.

When we have much corrosive sublimate to operate on, we may also try it by lime water, which throws it down of a deep yellow; by alkalies, which form with it an orange precipitate; by protochloride of tin, which gives a slate-gray powder; and by hydriodate of potassa, which forms a splendid scarlet precipitate.

3. *Copper.*—The poisonous effects of the salts of copper have long been known; but though little likely to be used as secret poisons, they sometimes produce death from being accidentally mingled with food, as in the use of culinary utensils of copper. The principal danger arises from cooking acescent or oleaginous food in such vessels, especially if that food be permitted to cool in them. The principal preparations of copper are the oxides, called *copper mineral green* and verditer; verdigris, which is a mixture of two acetates; the binacetate; carbonate, which generally forms on the surface of copper exposed to acid vapour and atmospheric air; sulphate of copper, or blue vitriol; and nitrate of copper. Of these, the salts most likely to be found in the human stomach are verdigris and blue vitriol. The symptoms are those of other irritant poisons, to which is added spasmodic rigidity of the limbs, in some cases amounting almost to tetanus. Salts of copper may produce salivation, and also jaundice. The morbid appearances are not very characteristic. The principal authors who have treated of this species of poisoning, are Falconer, Percival, Wildberg, Eller, Proust,* Orfila, Henri, and Deyeux.†

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* In Ann. de Chimie, t. lvii.

† In Jour. de Pharm. xv.

Albumen of eggs appears an antidote of some power against the salts of copper; and therefore, after evacuating the stomach, the whites of raw eggs should be administered. This remedy was proposed by Orfila, who found it very effectual in saving dogs from the effects of this poison. He also found ferro-prussiate of potassa very effectual. Duval stated that sugar was a useful antidote. This was denied by Orfila, but seems rendered probable by the experiments of Postel.* Metallic iron has been proposed also as an antidote, by Milne Edwards and Dumas. Inflammation should be obviated by antiphlogistic means.

The poison of copper may be sought for by boiling the contents of the stomach with acetic acid; this will dissolve every preparation of copper, and enable us to separate them from animal and vegetable matter by the filter. We may, if necessary, concentrate the solution by evaporation; and if the addition of ammonia give the solution a blue colour, we may be satisfied that it contains copper. A stream of sulphuretted hydrogen throws down a brown precipitate from the solution of copper; and if the quantity of copper be considerable, a piece of bright polished iron will become coated with a film of copper.

4. *Lead.*—The poison of lead is of considerable consequence, although never used as a secret instrument of revenge. Its oxides and salts all appear to be deleterious, but those from which accidents have most commonly happened are litharge, white lead, and sugar of lead. Guytonde Morveau showed† that some of the oxides of lead are sparingly soluble in pure water; and more lately, Bonsdorf states, that all of them are soluble in 7000 times their weight of distilled water. These often find their way into the stomach from little suspected sources, and produce a species of poisoning with very peculiar symptoms. Leaden pipes and cisterns are acted on by water, especially by soft rain-water; and the carbonate of lead thus formed being soluble in an excess of carbonic acid, is liable to enter the hu-

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* Journal de Pharmacie, t. xviii.

† Ann. de Chimie, t. lxxi.

man system with the food. Curious instances of the production of lead colic, from the impregnation of water flowing over the surface of the metal, occurred at Haerlem, Amsterdam, and Tunbridge.* In leaden cisterns, brilliant hard crystals of hydrated oxide of lead have been occasionally found. I once saw them half an inch in length in a cistern in my own house. Captain Yorke analyzed the crystals, and states, as his opinion, that the lead is dissolved in the form of oxide;† and Dr. Christison found that they contained some carbonate.‡

This poison is often introduced into the system by the use of wines which have been *dulcified* by lead. The low wines of France and Germany, when they become sour, are often thus rendered marketable; and the lead colic is by no means an unfrequent disease in both countries. There is an admirable essay by Fourcroy, "Sur les Vins Lithargyriés."§ Acescent articles of diet act on leaden vessels; and, when aided by heat, on the plumbiferous glazes of our earthenware.‖

It is well known that *new rum* is very apt to produce the lead colic, and that many of our soldiers perish from this cause, in our transatlantic colonies. The lead is derived from the leaden worm of the stills, and I have always found the rum, as received in glass bottles from the still, impregnated with lead; but, when it is kept in oak casks, the tannin of the oak is slowly dissolved by the spirit, and precipitates the lead in a very insoluble compound, by which the spirit becomes as wholesome as any other spirituous liquor. This circumstance renders *old rum* in great demand for the use of our navy and army. But an equally wholesome spirit might be easily obtained, by directly mixing the new rum with a decoction of oak-bark, or nut-galls, by which the lead will speedily be precipitated; and when

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* Tronchin, De Colicâ Pictonum. Brande's Journal, xiv.

† Phil. Magazine, 3d Series, vol. v.

‡ Treatise on Poisons, 478.

§ Mémoires de l'Académie, 1787.

‖ Baker's Essay, in Transact. Coll. of Physicians, Lond. I. Mérat, De la Colique Métallique. Beck's Medical Jurisprudence, 479.

racked off, the spirit will be free from lead. The danger might be also obviated by using tin tubes for still-worms, as enjoined a century ago by the State of Massachusetts.*

The use of lead glazes for earthenware, is another cause of lead colic but little suspected. The glaze of the coarser kind of earthenware is readily acted on by acescent food. Instances of lead colic, from this source, are not unfrequent in Spain, where much use is made of coarse earthenware for culinary purposes. These are the most general sources of this poison; but persons engaged in works where white lead is largely used, smelters of lead ores, painters, and potters are liable to the same deleterious influence. The symptoms produced are obstinate constipation, severe tormina, with the symptoms commonly known by the name of *painter's colic, colic of Poitou*, and *of Devonshire*. After these have subsisted for some time, the person begins to have paralysis of the limbs, first of one or both arms; in general, the extensor muscles suffer before the flexors, and the palsy may then become general in that limb, or extend to other parts. The preparations of lead, when given in large doses, appear to act as irritant poisons.

Orfila found that animals poisoned by sugar of lead had a preternatural whiteness of the villous coat of the stomach, if they perished speedily; but if their death were protracted, the inner coat of the stomach was reddened. The stomach has often been found corrugated after death.

John Hunter observed in those who died of the lead palsy, that the muscles were unusually dry, had a cream-white colour, and appeared opaque and tough, with the fibres remarkably distinct.†

Frequent ablution of the surface is the best prophylactic for those much exposed to the powder of the preparations of lead; and when lead has been introduced into the system with the food, the best means of obviating the return of the evil is by rigidly excluding lead from all culinary and economic purposes. Hard water is less liable to act on lead than soft water; and hence the impropriety of lead cisterns for rain-water. Mercury seems to have a beneficial effect in lead colic, especially when conjoined with opium; but this remedy has sometimes been employed too indiscriminately.

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* Dr. J. Hunter on the Diseases of the Army in Jamaica, in 1781 and 1782.

† Baker, in Trans. Coll. Physicians, Lond. i.

When a patient is suffering from the recent administration of lead, the best antidote is certainly a solution of phosphate of soda; and the next in efficacy is sulphate of soda, or of magnesia.

Lead is easily detected. To whatever articles it is suspected to enter, add vinegar, and boil; filter the solution, and all the lead will be in the clear liquor. If in large quantity, it may be detected by the sweetish astringent taste of the liquid; part of which may be tried by the addition of a solution of sulphuretted hydrogen, or of hydro-sulphuret of ammonia, which instantly darken the most dilute solution of lead; another portion may be tried by bichromate of potassa, which throws down solutions of lead of a brilliant yellow; a similar colour is formed with them and hydriodate of potassa.

5. *Antimony* is rarely a poison; because its most active and best known preparations are violently emetic, and thus counteract its effects. Its sulphurets are not very active preparations. The union of oxygen with antimony forms three definite compounds, two of which are considered as acids, but they are rarely objects of research to the toxicologist. The triple salt, tartrate of antimony and potassa or emetic tartar, is a very active preparation; but its powers as an emetic have sometimes counteracted its effects as a poison. It, however, lately caused the death of two persons in England, Thomas Combes, a man of twenty-four years of age, at Folkestone, in 1837, and of Ruth Winter, a child of two years, in 1838. In the first instance, three drachms were swallowed instead of a cure for ague; in the last, it was a dose intended for the father, and given by mistake to the child.*

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* Parliamentary Report, 1839.

Chloride of antimony, or butter of antimony, is a most acrid substance; but its very corrosive properties, and its instant decomposition by water, render it very unlikely to be internally administered.

Emetic tartar, when given to the lower animals, if vomiting be prevented by tying the gullet, causes inflammation of the lungs and stomach; and this would probably be its effects on man. The lungs appeared a mixture of orange-red, and violet-blue, and they were gorged with blood, which prevented the usual crepitus. It was also fatal when applied to a wound. In a man killed by emetic tartar, the stomach was violet-coloured, thickened, and covered with tough mucus, and the intestines empty.*

The best antidote for this poison is decoction of Peruvian bark, especially the yellow bark.

The detection is not difficult; sulphuretted hydrogen throws down a rich orange-red precipitate. When the antimony is mixed with animal and vegetable matter, add first a little muriatic acid to precipitate the contaminating substances, and then tartaric acid to dissolve any antimonial present. This will afford by filtration a clear liquid for the application of the tests. The sulphuret is best reduced by Dr. Turner's process; *i. e.* passing a stream of hydrogen over it when heated to redness in a tube.

6. *Zinc* in solution may be detected by a stream of sulphuretted hydrogen, affording a whitish precipitate. This will detect all the soluble salts of zinc, as it is the only metal of which the precipitate by sulphuretted hydrogen is permanently whitish. The only salt of zinc likely to become an object to the toxicologist is the sulphate, or *white vitriol.* Orfila gives several cases where an over-dose produced severe symptoms; and Mertzdorff has published a fatal case.† In general its very speedy emetic effect would probably prevent its most alarming symptoms.

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* Orfila.

† Horne's Archiv. für 1824.

7. *The oxides and sulphates of Tin* are substances of very little activity; but the chloride or muriate of tin is a very acrid poison. Orfila showed that it was fatal to dogs, when 20 or 30 grains are introduced into their stomachs, producing symptoms of great irritation, and prostration of strength; after death the stomach was highly inflamed, and appeared as if tanned. The muriate of tin affords a precipitate of a rich purple, the powder of Cassius, with deuto-muriate of gold; and when strong, coagulates milk completely.

8. *The Salts of Bismuth* are all acrid, especially the nitrate; but as the salt is easily decomposed, it is not likely to act as a poison. The sub-nitrate is, however, used in medicine, and is possessed of considerable power as an irritant. Orfila found that a drachm of it, retained in the stomach of a dog, killed it in thirty-six hours, with marks of high inflammation of that organ. A country apothecary gave a patient of mine *twelve drachm doses,* instead of a drachm divided into twelve doses; the man took ʒi the first day, ʒiij on the second, and ʒij on the third day, when I was called, and found him suffering extreme pain in his abdomen and throat. He had vomited on the previous evening; his pulse was small, he felt very feeble, and had much anxiety about the præcordia. I gave castor oil, milk porridge, and carbonate of potassa. The man was several days very poorly, but finally recovered. There is a fatal case recorded,* in which the dose was two drachms. It caused inflammation of the primæ viæ, gangrene, salivation, and death on the ninth day. In this case the whole alimentary canal, from the fauces to the anus, was inflamed, and there were spots of gangrene seen in the œsophagus and stomach. Though the urine was suppressed, the kidneys appeared healthy, as was the brain. Sub-nitrate of bismuth may be detected by calcining in a moderate heat the contents of the stomach, and adding diluted nitric acid to form a solution, from which water throws down a white precipitate.

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* Bulletin des Sciences Méd. t. xx.

9. *The Salts of Nickel* and the acids are all acrid, and are poisonous to the lower animals.

10. *The Salts of Cobalt* are no less so.

11. *Chromate of Potassa* produces deep fistulous sores on the hands of the dyers who use it; and even when applied to wounds in the dog, Gmelin found that it produced a lingering death in six days, with paralysis of the limbs, dyspnœa, and inflammation of the mucous membrane of the air-passages.

The salts into which chromic acid enters are easily detected by acetate of lead, with which they form a brilliant yellow precipitate, which does not afford iodine, like iodides of lead, to sulphuric acid and heat.

12. The only *Salt of Silver* interesting to the toxicologist is the nitrate. It is a deadly poison. Even ⅓ of a grain injected into the jugular vein killed a dog in 4½ hours, with violent tetanic spasms. It is readily decomposed in the stomach, so that small doses of it do not thus destroy life. In divided doses it produces a singular discolouration of the skin, which is permanent through life.

The soluble salts of silver are thrown down by alkaline and earthy muriates; and the precipitate is easily fusible into horn-silver. A plate of copper becomes silvered by immersion in the solution of silver.

13. *Gold* dissolved in nitro-muriatic acid is a very poisonous salt: 2 grains will kill a dog in two or three days. Injected into a vein, ½ grain will kill him in four minutes, after vertigo, dyspnœa, and piercing cries. The precipitate from this salt by ammonia, the *aurum fulminans,* was once used in medicine, but it is a dangerous remedy; 6 or 8 grains will destroy life.* It excites in man tormina, vomiting, diarrhœa, and sometimes profuse salivation, before it proves fatal. Gold may be detected by solution in nitro-muriatic acid; which solution affords the purple powder of Cassius with muriate of tin; and the neutral

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* Hoffmanni Opera, t. i. 227.

solutions of gold instantly gild silver or copper immersed in them.

II. Earthy and Alkaline Poisons.

1. *Baryta.*—Both the carbonate and pure baryta are very poisonous, as are the soluble salts of this earth. The symptoms are at first those of irritant poisons: the senses then become blunted, the respiration feeble, and convulsions close the scene. The narcotism produced by barytic salts is more invariable than that arising from any of the metallic poisons. Cattle are said to have been poisoned by licking the carbonate of baryta, in those districts where it is found; and a woman and her child are stated to have once perished at Anglezark in Lancashire, from swallowing, by mistake, about 1 drachm of the powder. An ounce of the muriate killed a man in an hour. He took it instead of sulphate of soda; it instantly produced intense pain, vomiting, deafness, and convulsions.* The stomach is found inflamed, and the brain shows congestive apoplexy.

The antidotes are any of the alkaline sulphates; which instantly form with all the poisonous salts of baryta, insoluble, inert compounds. Sulphuric acid, or sulphates, are also the tests of this earth; but it might be confounded with strontia, the salts of which do not seem poisonous, except in so far as they are acrid. The best distinction is obtained by procuring a muriate of the suspected salt, and dissolving it in alcohol. The muriate of baryta imparts a yellow colour to the flame of spirit; the muriate of strontia, a fine red.

2. *Lime* is only poisonous as an acrid. The antidotes for it are phosphates of soda or potassa, and water impregnated with carbonic acid. The detection of the salts of lime is easy. Its properties when pure are alkaline: it forms with sulphuric acid a substance of little solubility; but phosphoric and oxalic acids precipitate it from all its soluble combinations.

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* Brande's Journal, v. iv.

3. *Potassa and Soda.*—The pure alkalies and their proto-carbonates are poisonous. Several fatal accidents have happened from them. They act as strong irritant poisons, producing intense heat and pain in the abdomen, then cold sweats, tremors, and convulsive twitchings in the limbs; the stools are tinged with blood, and membranous flakes are mixed with the egesta. A lad at Dunfermline perished in twelve hours from a dose of 3 ounces of a strong solution of proto-carbonate of potassa;* and I have the stomach of a youth, who died in Edinburgh, from swallowing one ounce of it, by mistake for epsom salts. It was fatal in ten hours. The villous coat of the stomach appears patched with dark stains of ecchymosis.

When a person recovers from the primary symptoms, he may die from the consequences of injury to the primæ viæ. A case is described by Sir C. Bell, where the person, many years after, died of stricture in the œsophagus, brought on by swallowing soap-makers' ley.† The action of potassa and its carbonate on the animal economy have been ably investigated by Orfila and Bretonneau.‡ When the person lives some time, general peritoneal inflammation is observed after death. The best remedies are large quantities of mild oil. The tests of the alkalis are obtained from their combinations with different acids, and the manner in which they colour the flame of the blow-pipe.

Nitrate and chlorate of potassa are irritant poisons, producing dangerous inflammation of the stomach and bowels.

Nitre is a poison of some activity, but it requires a considerable dose to destroy life. Two fatal cases are recorded;‖ one died from 1 ounce of the salt in three hours; the other, after taking 1½ ounce of the salt, lived two days and a half. I was called to a servant girl who had taken, by mistake, as much as 1½ ounce of nitre. Her stomach was full of tea at the time;

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* Edin. Med. Journal, xxx.

† Surgical Observations, p. 1.

‡ Toxicologie, t. i. Archives Générales de Méd., t. xiii.

‖ Journal de Médecine, t. lxxi., 1787.

she vomited soon, and was convalescent next day. The usual symptoms of poisoning by nitre are nausea, extreme sense of chilliness, pain in the stomach, *tinnitus aurium*, great debility, and occasionally tetanic spasms. The secondary symptoms are inflammatory, and often require bleeding.

When nitrate or chlorate of potassa can be had in the solid form, the first may be known by its ready deflagration with charcoal in a crucible; the second by putting a drop of sulphuric acid on a mixture of the salt with sugar, which it instantly ignites.

4. *Ammonia and its Salts.*—They all act rapidly as irritant poisons, and have, besides, a violent effect on the nervous system, especially on the nerves of the spinal cord. This last effect is principally produced by pure ammonia and its carbonate. Convulsions have been caused by the too long continued inhalation of the vapour of ammonia; and it has several times proved fatal to man, terminating in severe bronchitis. Such a case occurred in Edinburgh, which caused death in forty-eight hours. For this species of poisoning, muriatic acid vapour is the best remedy. On the reception of carbonate of ammonia in the stomach, we should administer diluted vinegar instantly.

The hydrochlorate of ammonia appears also to act as a poison of considerable energy.

We detect the presence of ammoniacal vapour by the smell, and by a rod dipped in the hydrochloric acid, which gives rise to white fumes of hydrochlorate of ammonia.

5. *Alkaline sulphurets* are all poisonous, chiefly from the readiness with which they give out a large quantity of sulphuretted hydrogen gas; which is poisonous when inhaled, and when injected in quantity into the alimentary canal. The villous coat of the stomach, in cases of poisoning by alkaline sulphurets, resembles in colour the skin of a toad, and the muscular coat is congested with blood. The alkaline sulphurets act as narcotico-acrid poisons. Their presence is ascertained by a weak acid, and exposing a piece of paper, dipped in sugar of lead, to the fumes.

III. ACID POISONS. The three mineral acids are only poisonous from their corrosive qualities, by destroying rapidly the tissues to which they are applied.

1. *Sulphuric acid*, when strong, decomposes and blackens animal matters by evolving their carbon. It disorganizes the fauces, gullet, and stomach; when not speedily fatal, it lays the foundation of stricture of the gullet, and the patient is long harassed by dysuria and constipation. Sulphuric acid has frequently been swallowed by mistake, and thus has often proved fatal. A fatal case occurred in the Edinburgh Infirmary in 1840.* The parliamentary report on poisons shows, that twenty-five cases of poisoning by this acid occurred in South Britain within two years; of these, two were cases of determined suicide, three of real insanity: the rest were accidental. It is a capital felony to throw sulphuric acid maliciously in the face.

2. *Nitric acid* destroys the animal tissues, and gives them a yellowish hue, especially in the fauces, and when applied to the skin.

The work of Tartra contains fifty-six cases of poisoning by nitric acid: thirty-one arose from accidental mistakes; twenty-four were suicide; twenty-seven died; twenty-nine recovered, of whom twenty-one were cases of complete recovery, and eight of imperfect recovery.†

3. *Muriatic acid* destroys the tissues also, but often renders the fauces whitish, and sometimes as if the surface were of ivory. In the "Medical Gazette" for 1839, is a case of poisoning by muriatic acid, which was fatal within twenty-four hours, with terrible agony. The mucous surface of the œsophagus was destroyed. The stomach was lined with yellow lymph, and below this it appeared blackened, as if charred. No acid could be detected in the stomach or its contents, but stains of muriatic acid were found on the clothes of the deceased.

The symptoms produced by these three acids are similar, and the best remedies are the same for all, viz. the copious use of mixtures of chalk or magnesia with milk.

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* Published by Dr. Craigie, in Edin. Med. Journal, vol. liii.

† Traité d'Empoisonnement par l'Acide Nitrique. Par. 1802.

The three acids destroy the clothes, corroding them when strong, and when diluted, staining them of a reddish-brown. This circumstance becomes of importance in cases of maliciously throwing acid on any person, when no part of the acid liquid has been preserved. The stained portions of clothes, soaked in distilled water, will give out the acid. If sulphuric acid be present, it is best detected by nitrate of baryta, which gives a white precipitate, insoluble in pure nitric acid. Muriatic acid is detected by the addition of nitrate of silver, which throws down insoluble muriate of silver. Nitric acid is best recognised by its effect in destroying the colour of sulphate of indigo, when heated with it in a tube.

4. *Oxalic acid* is a most deadly poison. It differs from other acids derived from the vegetable kingdom in not containing hydrogen; being, like the mineral acids, a binary compound. Its taste is so intensely sour that it cannot be employed as a secret poison; but it has been swallowed by mistake for sulphate of magnesia, so as to prove fatal. Its alkaline salts are almost equally poisonous, especially the binoxalate of potassa, or *salt of sorrel,* and they are speedily fatal when applied to wounds. Oxalic acid renders the tongue red and inflamed, and it corrodes the stomach; burning pain in the primæ viæ speedily comes on; cold clammy sweats, a faint and fluttering pulse succeed, and palsy of the heart soon appears; proving that this substance is not only an acrid but a true narcotic. Unfortunately, its effects are so violent and sudden that there can little be done by art to save the patient. Instant evacuation of the stomach, and the exhibition of chalk or magnesia mixtures, are the best means to be employed. Even when the person survives the immediate effects, he often dies of the inflammation or the corrosion of the alimentary canal.

The best method of detecting oxalic acid is to precipitate portions of it by solutions of lime and magnesia. The precipitate by the first is not decomposable by an acid; sulphate of copper gives a precipitate with oxalic acid, insoluble in a little muriatic acid; and the precipitate with nitrate of silver, when dried, deflagrates by a gentle heat. When the oxalic acid is much mixed with animal and vegetable matters in the stomach, or when chalk or magnesia are administered as antidotes, the acid is more difficult of detection. It will require boiling, with carbonate of potassa, filtering, acidulation with nitric acid, again filtering, precipitating by acetate of lead, and separating the oxalic acid by a stream of sulphuretted hydrogen, which precipitates the lead.

IV. SIMPLE SUBSTANCES WITH POISONOUS QUALITIES.

1. *Phosphorus,* even in very small quantities, is poisonous: two grains have proved fatal to a man. In that case there were sugillations on the belly and thighs, the scrotum was bluish and phosphorescent, the chest contained much fluid dark blood, and the muscular coat of the stomach appeared inflamed, with dark spots about the cardiac and pyloric orifices. Evacuation of the stomach, and the administration of mucilaginous, but not oleaginous substances, are the means we should employ to give relief in such cases. When the patient lives for some time, it will be difficult to detect the poison, unless the morbid appearances above noted may be considered as characteristic. Solid phosphorus is easily detected by its inflammability. In a fatal case of poisoning by 3 grains of phosphorus, published by Fontanelle,* minute particles of solid phosphorus were discharged by stool, which shone in the dark, and burnt small holes in the sheets on the bed.

2. *Iodine, and Hydriodate of Potassa,* are active substances, which, if given in excess, are apt to produce irritation of the system; vomiting, excessive langour, a feeble pulse, pains in the stomach, and cramps in the limbs; bilious vomiting and purging have followed large doses of iodine. It stimulates the liver, causes absorption of indolent glandular tumours; and, it is

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* Revue Médicale, t. iii: Par. 1829.

said, that its long continued use has caused the disappearance of the testes and mammæ.*

In dogs poisoned by it, the stomach was found inflamed, with numerous ulcerated points on its villous coat. No antidote is known. Its detection is easy. Boiled solutions of starch are delicate tests of the presence of iodine, or of hydriodic acid, by the intense blue colour produced. If hydriodate of potassa be present the colour is evolved on adding to the starch a drop or two of the sulphuric acid.

3. *Bromine* is more poisonous than the last substance, but it is so rare, that it is unnecessary to describe its effects or mode of detection.

v. GASEOUS POISONS.—Of these some are fatal from the irritation they produce, A; others are narcotic, B.

A.

1. *Chlorine.*—This gas, if incautiously inhaled, destroys life, by the irritation it produces. It causes violent constriction of

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* See Cogswell on Iodine: Edin. 1837. Manson's Researches.

[The injurious effects of Iodine have been deposed to, by many observers—by Magendie, Orfila, Gairdner, Coindet, Lugol, Manson, Delisser and others; but Dr. Gully affirms, that he has given as much as three drams of the tincture daily, without observing any effect. Dr. Kennedy, of Glasgow, (Lond. Med. Repository, for 1822,) exhibited, within eight days, nine hundred and fifty-three grains of iodine in the form of tincture; and Dr. Buchanan, (London Medical Gazette, July, 1836,) gave half an ounce of the iodide of potassium within twelve hours without any unpleasant result, provided diluents were largely taken at the same time.

On the other hand, Dr. Laurie (Lond. Med. Gazette, July 3, 1840, p. 591) considers the iodide of potassium very uncertain, and at times dangerous, although he esteems it by far the best of the recent remedies, and prescribes it more frequently than any other remedy. As regards the wasting of the testes and mammæ, it must be a rare occurrence. The Annotator has administered the various preparations of Iodine largely both in public and private practice; yet he has never seen a single case. Such also has been the result of the observation of Pereira, Magendie and others, (cited in Dunglison's New Remedies, 3d. edit. p. 302. Philad. 1841. See, also, Ibid. p. 395.)]

the epiglottis, and severe pain in the chest, even when diluted. It disinfects air contaminated by animal emanations. Its solution in water kills dogs; and when injected into a vein, it speedily destroys life. It is most certainly detected by its smell.

2. *Hydrochloric Gas or Muriatic Acid Gas* is still more irritating and destructive. It is largely emitted in the manufacture of soda from salt, and is then most hostile to vegetation; $\frac{1}{30000}$ of it contaminating the atmosphere so as to destroy plants, as I found in experiments made several years ago.

3. *Sulphurous Acid Gas* is also most suffocating; is, even when much diluted very destructive to vegetation; and has, as emanating from burning sulphur, sometimes been employed to commit infanticide. It renders the lungs very livid.

4. *Nitric Oxide, and Nitrous Acid Vapour,* are poisonous irritant gases, that cannot be respired, unless largely diluted. The attempt to respire the former nearly proved fatal to Davy. The fumes of the latter have accidentally proved fatal to individuals, producing burning sensations in the throat and chest, an expectoration of a yellowish matter, and alvine dejections of a bright yellow colour. Before death the body becomes livid, the breathing laborious. Vapour of ammonia cautiously inhaled may relieve from the effects of this gas, of hydrochloric, and of sulphurous acid gases: but we have no means of detecting any of these poisonous gases, in the small quantity they ever can exist in the human chest, except by the sense of smell.

5. *Ammonia* is not only irritating when received into the lungs, but is, as we have already said, narcotico-acrid.

B.

6. *Nitrous Oxide,* the exhilarating gas of Davy, is narcotic, yet can scarcely be considered as poisonous, since it may be inhaled several times a-day without injury; but it seems to have a tendency to cause cerebral congestion.

7. *Sulphuretted Hydrogen* is one of the most poisonous of gases, destroying life when injected into the intestines, or into the cellular tissue, when received into the lungs, or even when extensively applied to the surface of the body. It is largely given out in the corruption of some kinds of animal matter. Many serious accidents from this gas have happened in clearing out the Parisian *fosses d'aisance*. The symptoms are instantaneous asphyxia, with discharges of bloody froth from the mouth, and convulsive movements of the limbs; motion and sensibility soon cease, the lips become livid, the eyes close, and lose their lustre, the surface becomes cold, the action of the heart is tumultuous, then feeble, and before death complete tetanus often comes on. Even when the gas does not kill, it produces severe tormina, nausea and drowsiness. The body of one killed by it quickly becomes putrid; the skin is livid, and soon meteorized; the brain tender, and of a greenish hue. The proper treatment of persons suffering from this gas is to carry them into pure air, to dash cold water and vinegar over the body, to rub the surface diligently with warm flannels, but to admit air freely to the surface, while the palms and soles are to be strongly brushed. Lavements of cold water and vinegar should be first used, and then lavements containing common salt; when the heart beats violently, blood should be abstracted. Impregnating the air of the apartment with a moderate quantity of chlorine gas will also be useful in such cases; or injecting weak solutions of it into the stomach and bowels. Chlorine instantly decomposes sulphuretted hydrogen.

This gas is well known by its smell resembling that of rotten eggs. Solutions of sugar of lead are very delicate tests of its presence even in minute quantity.

8. *Carburetted Hydrogen*, of various qualities, is given out by stagnant waters. It is one of the results of combustion, and is abundantly produced in coal mines, where it is the formidable *fire damp*. When the atmosphere is much contaminated with it, it oppresses the breathing, and produce headach and giddiness. When mixed in the proportions of about $\frac{1}{12}$, with

the atmosphere of mines, it will explode on the approach of a flame; yet in such an atmosphere persons will continue to work for some time with impunity; but even if there be no risk of explosion, the narcotic effects of the gas begin to be perceived on those long exposed to it.

In the early experiments of Davy, inhaling this gas produced very alarming effects, which prove its narcotic qualities; but Nysten found that it is not very active when injected into the blood-vessels, probably from the ease with which it is absorbed by the blood.* The treatment in cases of poisoning by this gas, should consist in removing the person into pure air, and cautiously administering a mixture of chlorine with common air. Two cases of death from coal-gas, which is another species of carburetted hydrogen, occurred in Leeds in 1838. The gas escaped during the night and suffocated two women.

9. *Carbonic Oxide*, mixed with other gases, is given out by burning fuel, especially if moist, and burning slowly. It scarcely becomes an object to the toxicologist in its pure state. It is inflammable, rather lighter than atmospheric air, and has a disagreeable smell. It may be respired when diluted; but produces temporary intoxication, and when injected into the veins gives the blood a brown colour.

10. *Carbonic Acid.*—This gas is well known to be heavier than atmospheric air, to be totally irrespirable when pure, and to be speedily fatal to animals plunged in it. It is always present in the air in minute quantity; but is largely given out by the burning of all sorts of fuel, is produced in every species of fermentation, is formed in the respiration of all animals, and, under certain circumstances, it is given out by plants, particularly in the dark. From these sources, the air in confined situations, may become impregnated with it, in a proportion inconsistent with the safety of man. Numerous instances of its fatal effects have been observed in the neighbourhood of large

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* Recherches de Physiologie: Paris, 1811.

fires, in breweries, in crowded apartments; and in rooms where many plants are growing, it is unhealthy to sleep.

Two men perished by this gas in 1839, from having fallen asleep near a limekiln in the neighbourhood of Kendal. Some years ago I was called to two individuals, who had imprudently entered a vat in a brewery at Liverpool, from which the fermented beer had recently been drawn off. The face of the one was livid and bloated; that of the other was placid, the lips red, and he appeared as if in tranquil sleep. The eyes of both were brilliant and prominent; the bodies long retained their heat; but all means to restore animation were ineffectual, though continued for some hours. Fatal accidents have often happened in the confined cabins of small vessels at Leith, Glasgow, and Liverpool, from burning fuel in ill-constructed fireplaces, and closing the hatches. The fatal catastrophe which occurred in *St. Martin's watch-house* in London in 1742, and the more memorable one in the *Black Hole* of Calcutta in 1756, are striking instances of the danger of breathing an atmosphere contaminated with carbonic acid, the product of respiration.

When a confined atmosphere is much mixed with it, uneasy respiration is speedily felt, and the person may escape the danger by seeking the open air; but at other times drowsiness or stupor comes on, before any warning is given, and the individual loses the power of attempting his escape. When the gas is undiluted, it is almost immediately fatal to animals immersed in it; and even if the animal be made to respire pure air, while the whole body, except the head, is immersed in carbonic acid, life will be extinguished.

After death from this gas, the features generally remain placid, the eyes open and brilliant, the body long retains its heat and flexibility. When the person has not been exposed long enough to extinguish life, the breathing may be stertorous and oppressive, the face flushed, the pulse feeble, the eyes prominent and wildly rolling about, the tongue swollen, and the saliva flowing out of the mouth.

The proper treatment consists in removing the patient into the open air, or into a well-ventilated room; the surface should be sprinkled with vinegar and water, and every few minutes rubbed dry with hot towels. If the valve bellows be at hand, the foul air should be first drawn from the lungs, and its place immediately supplied by fresh air, thrown in by the same machine. This alternation may be two or three times repeated, and then we should imitate natural respiration as much as possible, throwing in air by the bellows, and aiding the expulsion of the air by gentle pressure on the chest. Brushing the soles of the feet and palms of the hand with stiff brushes, stimulating the nose by a feather, or by ammonia, or useful auxiliaries. When animation is restored, it is time enough to put the patient to bed.

VI. VEGETABLE POISONS.—These include most of the narcotic and narcotico-acrid poisons of Orfila. Narcotism begins with a sense of fulness in the head, then succeed a sort of intoxication, dizzness, headach, loss of voluntary motion, almost amounting to paralysis, sometimes convulsions, and finally stupor and coma. These symptoms may not all be present; for each poison has its peculiar modification of the general symptoms.

The poisonous qualities of most vegetable substances reside in certain *alkaloids*, the bases of which appear to be carbon and hydrogen, with a small quantity of nitrogen. They have all been discovered since 1815, and many of them act with extreme energy on the human frame. A few plants owe their poisonous qualities to their containing *hydrocyanic acid;* but the greatest number act by their peculiar *alkaloids*.

The *post-mortem* examinations of those who perish by narcotic poisons, do not generally throw much light on their mode of destroying life; and there are some diseases that bear considerable resemblance to narcotism. Thus, *Apoplexy* chiefly differs in there having usually been some warning before the fatal attack, and in coming on during a meal. Narcotism is generally perceived from half an hour to one hour, or more, after taking the poison. Narcotism is more gradual than apoplexy, and at first the person may be roused from his stupor. Apoplectics generally survive for a day, or often much longer. *Epilepsy* may generally be distinguished by the history of the case, by the abruptness of the attack, by the person being instantly rendered insensible, and by its rarely proving fatal on the first attack. One species of fatal *syncope* is more difficult to be distinguished from narcotism; and if it has not been witnessed, we do not know how it can be recognised after death.

1. *Opium.*—The deadly effects of this substance have been long known; and it was supposed to be a proximate vegetable principle, simple in its nature and peculiar in its effects. The best opium in the market comes to us from the East, and is generally termed *Turkey opium.* The quantity raised in India is immense, but until lately it was not an article of exportation. In 1838, India exported to China 4,500,000 lb. of this drug, and about one-half of it was raised in Malwah, on the Malabar coast, from whence, ten years before, not a single pound was exported. A considerable quantity is produced in Egypt, since it fell under the dominion of the enterprising *Mehemmed Ali.* Some very fine opium is produced in Great Britain; and in Germany, of late years, the cultivation of a *purple* variety of the poppy, is stated, by Biltz of Esfurth, to yield a much larger quantity of morphia than the best Turkey opium.* Modern chemistry has shown that opium, like many other active vegetable substances, owes its qualities to an *alkaloid,* which may be separated, by chemical processes, from many other ingredients. The first of these alkaloids was detected in opium about 1812; and the care with which this important drug has been since examined has shown it to be an exceedingly compound substance, consisting of not less than of thirteen, or perhaps of fourteen different vegetable principles, of which six are crystallizable.

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* Annalen der Pharmakie, tom. iv.

These ingredients, according to the masterly analysis of Pelletier,* and the subsequent discovery of Robiquet, are,

Crystallizible.	1. Morphia.		7. Brown Extract.	Amorphorus.
	2. Narcotia.	Alkaline.	8. Caoutchouc.	
	3. Codeia.		9. Resin.	
	4. Narceia.		10. Concrete oil.	
	5. Meconia.		11. Gum.	
	6. Meconic acid.		12. Bassorine.	
			13. Lignine.	
			14. Acetic acid?	

This last ingredient I have always found in opium.

All these may be separated by the process employed for obtaining morphia, or its salts. The codeine exists in a quantity not exceeding 1 per cent; the narceine and meconine in still more minute quantities, so that few chemists have even seen them.

Of these, in a toxicological point of view, the most important are *Morphia* and *Meconic acid.* These two ingrdients appear to exist in combination in opium; and when magnesia is added to a watery solution of opium, an insoluble meconate of magnesia is formed, from which the morphia, sparingly soluble in water, is taken up by alcohol; or, if we add muriate of lime to the liquid, instead of magnesia, we obtain meconate of lime, as an insoluble precipitate, and a soluble muriate of morphia; which last when purified by several nice chemical manipulations, is obtained in minute white silky crystals. This is the valuable part of opium to the medical practitioner, as it is powerfully hypnotic, and is less liable to cause headach, nausea, and itching of the skin, than crude opium.

Morphia, like the other ingredients of opium, exists in very variable quantities in opium of different qualities. The best

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* Journal de Pharmacie, t. viii. Nov. 1832.

Turkey opium usually yields from 6.25 to 7.80 per cent. of purified hydrochlorate of morphia.

The amorphous ingredients may be considered as impediments to the purification of the morphia.

Morphia is very insoluble in watery fluids, and it is usually united to acetic or hydrochloric acid, to render it soluble. The hydrochlorate retains its colour and its properties better than the acetate, and is admirably prepared in Edinburgh, where it was first manufactured by Dr. W. Gregory.

The Lancashire *Black Drop* is an impure acetate of morphia, of variable strength, and therefore should not be prescribed. *Battley's Sedative* has no valuable quality which does not exist in muriate of morphia. It is acidulous, but seemingly without spirit, and contains much less meconic acid than laudanum.

Codeia or *Codeine,* has slight alkaline properties. It is not at all hypnotic. Soon after its discovery, I took five grains in tea, which produced no tendency to sleep, but gave rise to intense itching of the skin, that lasted about two hours; and the same effect was afterwards felt by Dr. W. Gregory, and several of his pupils. It is probably to this substance that the irritative effects of opium on the skin are owing.

When either this substance or opium is administered in an over-dose, the symptoms are drowsiness and insensibility, but this state is often preceded by a slight excitement: the face assumes a ghastly hue, the jaw falls, the eyelids remain half open, the pupils are strongly contracted; stupor and complete coma succeed; convulsions are rare in adults, but often are seen in infants. Opium produces its fatal effect, however introduced into the system; and even when applied to a raw surface, has destroyed life. Morphia is stronger than opium, in the proportion of 1 to 6.

Orfila has published two cases of poisoning by the salts of morphia. A case of the same kind occurred at Montrose in 1834, in which 10 grains of the muriate of morphia proved fatal in ten hours. Two other cases occurred in 1837, one in the county of Stafford, and the other in the county of Lancaster. In these cases the acetate was administered in an over-dose by mistake. No less than 198 persons were poisoned in England and Wales, in the years 1837 and 1838, by opiates.*

The principal morbid appearances are great turgescence of the vessels of the brain, and sometimes serous effusion between its membranes, or in its ventricles; but sometimes no morbid appearance can be detected in the head; the lungs are gorged with blood, the stomach rarely appears inflamed, the blood is found fluid in the heart, and the body runs rapidly to decay.

Evacuation by the stomach-pump, or by emetics, is the remedy chiefly to be trusted; and after the patient is roused, we must prevent him from falling asleep while any tendency to stupor is perceived. Compelling the person to walk about, pouring water occasionally into his ears, shaking him, and applying hot water to his legs so as to excite pain, are the means usually had recourse to. Artificial respiration appears to have saved one person who was found comatose. No antidote is known.

The best tests of crude opium are those which show the presence of morphia and meconic acid. The contents of the stomach, in a case of the poisoning with opium, may have the smell of that drug. The whole should be emptied into a clean mortar, and reduced to a thin pulp by the addition of distilled water; acidulate the whole with acetic acid, strain and filter, then reduce the liquor to the consistence of a syrup by a gentle heat; add alcohol gradually, boil, and filter when cold. The spirituous solution will contain all the morphia. Again, evaporate to the consistence of syrup, and add magnesia; this will throw down meconate of magnesia and the morphia in the form of a grayish powder, which may be freed from much of its colouring matter by washing it with cold water, and then with cold proof spirit. The morphia may now be separated from the meconate of magnesia by hot strong alcohol: concentrate this last solution, which will have a bitter taste, and, on adding a drop of nitric acid, will strike an orange-yellow colour, soon passing to golden yellow; and will give a duck-blue with permuriate of iron.

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* Parliamentary Report.

The meconate should be decomposed by hydrochlorate of baryta, which throws down an insoluble meconate of baryta; from which the addition of very diluted sulphuric acid separates the meconic acid. This acid has a silky lustre in the state of crystals, and affords with permuriate of iron a very intense red. There is only one source of fallacy in operating with meconic acid from the human stomach, which must be guarded against,—namely, that the sulpho-cyanates of the alkalis precipitate permuriate of iron of a red colour; and some of the secretions, as the saliva, contain a sulpho-cyanate. If the solution of morphia be strong, there is no danger of mistake; because of the intensity of the colour produced. Professor Forbes has also shown, that the two solutions affect the prismatic spectrum in a different manner; though perhaps this test is less applicable to medico-legal causes, where the quantity of opium is generally very minute. When the meconate of iron is introduced into Dr. Brewster's *Analyzing Prism*, so placed that a ray of light may successively pass through a thicker and thicker column of the fluid, the absorption of the coloured rays of the spectrum takes place from the green rays towards the red, or least refrangible end of the spectrum; but when sulpho-cyanate of iron is similarly treated, the absorption commences with the red rays, and proceeds towards the green.

2. *Hydrocyanic acid* or *Prussic acid* forms the poisonous ingredient in an important class of vegetables. It is yielded by the kernels of the *bitter almond*, and of several other species of that genus; by the leaves of the cherry-laurel, or *Prunus lauro-cerasus;* by the *Prunus padus;* and probably is contained in the seeds of the *Pomaceæ*, and in all vegetable productions having

the odour of bitter almonds. The acid, when concentrated, is the most deadly of all poisons; producing almost instant death, whether swallowed or introduced by a wound.

This acid may be obtained in its most concentrated form, by passing a stream of sulphuretted hydrogen over bicyanide of mercury, gently heated in a tube. The product must be condensed in a receiver, kept cool by ice or snow salt. This strong acid is extremely volatile, and its vapour, in pouring it from one vessel to another, should be carefully avoided. It is very liable to decomposition in this strong state; and is used in medicine much diluted with water, or with alcohol. The German acid varies in strength from 1 to 10 per cent. of pure acid; but Keller's hydrocyanic acid contains 25, and Robiquet's no less than 50 per cent. The medicinal acid of the London and Dublin Colleges contains 2 per cent.; that of the Edinburgh College, has a strength of 3.3 per cent.

Even the diluted hydrocyanic acid of the apothecary's shop is fatal in a very moderate dose; and the essential oil of bitter almonds is not less so. An infusion of the leaves of cherry-laurel is a very deadly poison: bitter almonds have sometimes proved fatal; and the same effect has followed on eating the blossoms of the common peach, *Prunus persica*, in a salad. When the preparation is concentrated, the death is very speedy; the breathing immediately becomes laborious; convulsive movements of the limbs come on, and in dogs it ends in violent tetanus. After death the eyes are glistening, the pupils dilated, the muscles of the spinal column stiff, the countenance pale, and often composed, the abdomen drawn in; the veins of the brain are found to be loaded with black blood, and the blood in the heart and great vessels is generally fluid. In some instances, the blood and cavities of the body have exhaled a strong odour of prussic acid; and the blood is said occasionally to have exhibited a bluish tint when the strong acid has been administered. The bile has often been observed to be of a dark blue hue in such cases.

The essential oil of the bitter almond is very poisonous: yet it is employed to flavour liqueurs, and other articles of diet, by persons little aware of its activity; and children are said to have been poisoned by eating *macaroons,* a sort of sweet-cake, flavoured by this oil. Three persons were poisoned in England by this oil in 1837 and 1838.

The distilled water of cherry-laurel, is a very deadly poison. It was by this liquid that Sir Theodosius Boughton was destroyed in 1780. Harriet Ricketts, aged fifteen, in 1838, was poisoned by a decoction of these leaves, supposed to have been administered to cause abortion. This case occurred in Essex. The medicinal prussic acid has repeatedly destroyed life. No less than thirty persons committed suicide by this acid in England and Wales in the years 1837 and 1838.*

No remedy can be of service in poisoning by this substance, unless instantly administered: but ammonia appears to have a great power in alleviating the symptoms when the quantity of hydrocyanic acid has not been very great. Ammonia diluted with water should be introduced into the stomach; its fumes sufficiently diluted with air allowed to enter the lungs, taking care not to excoriate the air-passages by the too free use of the ammonia. Another very powerful antidote is chlorine. It is most advantageous to employ the vapour of water containing about one-fourth part of its volume of chlorine gas. This may be inspired without risk; it has saved the lower animals, when the poison had been administered for five minutes before its application, even after the convulsive stage had passed, and that of insensibility had supervened. In Orfila's experiments, in ten minutes after inspiring diluted chlorine in this manner, the recovery of the animals was certain. Herbst, of Göttingen states, that dashing cold water on the surface of the body, is a powerful antidote in such cases: it is most successful *before* the convulsive stage, but is useful during the spasms.

The tests of hydrocyanic acid are certain when we can obtain it in quantity; but when we must look for it in the body, the smell is its best criterion. The stomach and the blood will sometimes have its peculiar odour for more than three days after death; and if the body has been buried within twenty-four hours, the odour will occasionally be cognizable till the eighth day. When we can obtain a little of the liquid acid, nitrate of silver is a very delicate test. A white precipitate is formed, which, when dried and heated in a tube, gives off *cyanogene,* a gas that burns with a rose-coloured flame. If we add to the suspected liquid sulphate of copper, a rich emerald-green solution is formed; and if to another portion of the liquor we previously add a drop or two of potass, that test will throw down a greenish salt, which is partially dissolved by hydrochloric acid, leaving behind a cyanide of copper, which will yield cyanogene like the precipitate of silver. This test will detect prussic acid in 20,000 times its weight of water.

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* Parilamentary Report.

But it may be necessary to eliminate the acid from the contents of the stomach; the method of Lassaigne and Leuret seems well suited for this purpose. If alkaline, neutralize the liquid, after filtration, by sulphuric acid; introduce it into a large retort, and distil with a water-bath heat, until one-eighth of the whole has passed over. This fluid will contain any hydrocyanic acid which may be present.*

3. *Substances yielding Strychnia.*—The vegetable substances yielding this new alkaloid all act in nearly the same manner, and are very poisonous. The alkaloid was first obtained from the *Strychnos nux vomica,* and *S. Ignatii.* One nearly similar in its properties is said to be found in the bark of *Brucea antidysenterica,* to which the name of *Brucia* has been given. This substance is likewise found in nux vomica united to strychnia. Both are highly poisonous, producing convulsions and tetanus; both are intensely bitter. Strychnia is used in paralysis, with advantage, in of doses from one-eighth to one-fourth of a grain. Now that it is an officinal preparation, it

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* Journal de Chim. Méd. ii.

may be employed as a poison; and there is too sure a substitute, in malicious hands, in the seeds of the two plants from which strychnia was first obtained. A dose of fifteen grains of the powder of nux vomica has been fatal.

In the Parliamentary Report there are three cases of poisoning by nux vomica in powder, and two by strychnia. Three were accidental, but two were suicides. Mr. Ollier has published an interesting case of death from three drachms of the powder of nux vomica.*

The symptoms from this powder, and from a much smaller dose of strychnia, are similar. Spasms speedily ensue, with anxiety and agitation, the limbs become stiff, the face and hands livid, from the impossibility of respiration, produced by the fixation of the muscles of the chest. These severe affections come on in paroxysms: the intervals exhibit nausea, a feeble pulse, and profuse perspiration; the repetition of the fits destroys life; and the victim seldom lives above an hour.

The best remedies, after evacuation of the stomach, appear to be the simple substances chlorine and iodine, as we are assured by Donné of Paris.

Where the death has been rapid, there are little or no marks of inflammation to be seen in the stomach; but when it has been lingering, the stomach and intestines show traces of violent inflammation; their colour is a violet, and incipient gangrene has been observed in some cases; serous effusion has been found in the head, the blood has remained fluid, and the body often retains, after death, the rigidity of the tetanus in which the sufferer died; but in dogs, poisoned by it, the limbs are sometimes relaxed after death.

The powder of S. Ignatii is stronger than that of S. nux vomica: both adhere obstinately to the villous coat of the stomach, and will generally be found there after death. They may be distinguished by their intensely bitter taste, by becoming orange-red when nitric acid is added; a hue which soon passes to golden-yellow.

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* Lond. Med. Rep. xix. [A fatal case of poisoning by strychnia has been related by Dr. Blumhardt, of Stuttgart. (Medicinisch. Correspondenz-blatt, in Encyclograph. des Sciences Mé-dicales, Sept. 1837; cited in Dunglison's New Remedies, 3d edit. 451.) Two scruples of strychnia were taken.]

The celebrated Javan poison is prepared from the *Antiaris toxicaria* and *Strychnos tieuté*,* plants belonging to the natural order of the *Apocyneæ:* another plant of the same order, *Cerbera tanghin*, is so deadly, that a single seed, it is said, will destroy twenty persons.

The *wourali* or *wourara* poison of South America is said to be derived from a *Strychnos*. M. Schomburgh informs us, that the Indians prepare this poison chiefly from a plant, which he has named *Strychnos toxicaria*, a new species of that genus; but the effects of the wourali, especially upon birds, would seem to indicate some other poison also in the composition. Waterton and Hillhouse assert, that the juice of ants, and fangs of poisonous snakes, are added to the wourali poison during its inspissation at a slow heat. The natives of Guyana kill animals by blowing, from a long slender tube, a little spiculum of wood, dipped in wourali poison. The effect is very deadly, even to large animals. Some of the poison which I carried to Edinburgh readily destroyed dogs, when a lancet dipped in it was inserted below the skin of the thigh of the animal. I have found it fatal to animals in very minute quantity when inserted under the skin.

The bark of a tree, said to have been brought from South America, has proved poisonous when administered instead of the true Angostura bark, *Galipea officinalis*, or *Bonplandia trifoliata*. But it is now found that the so-called *False Angostura bark* is the bark of the Strychnos nux vomica, and was imported from the East Indies.

When we suspect any substance containing strychnia to be in the stomach, digest its contents with alcohol, and concentrate this tincture, which will be intensely bitter; precipitate by ammonia, and this precipitate, when a drop or two of nitric acid is added, will become orange-red if any strychnia be present.

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* More properly *chetik*, according to Dr. Horsfield.

4. *Hyoscyamus niger.*—The whole plant is narcotic, especially the roots, which have several times caused fatal effects, by being eaten instead of parsnips. The symptoms are active delirium, in which persons have danced and reeled about until stupor supervened. A family of six persons were affected in this manner: one of them died on the morning after the eating the roots of the plant.* In persons fully under this stupor, stimuli cease to rouse, and the eye is insensible to light, or even to being touched.† Emetics are the remedies; but we have no particular tests of this poison.

Besides Hyoscyamus, other *Solaneæ* are narcotic. This is especially the case with *Solanum nigrum* and *S. mammosum.* Both owe their activity to an alkaloid, *Solania;* which is capable of exciting vomiting, hurried respiration, and stupor.

5. *Lactuca virosa* is a poisonous plant, with a juice that is highly narcotic, and has the smell of opium. This juice, when inspissated, forms the *lactucarium* of the shops, which was at first derived from the *Lactuca sativa,* but is obtained in greater quantity, and of precisely the same quality, from *L. virosa.* Stupor and coma follow an over-dose of lactucarium.

6. *Tobacco* is a well-known narcotic, of which the detection will be difficult, except by the smell. The oil of tobacco is combined with *nicotine,* and is a poison of great energy. It produces speedy coma; but in the lower animals does not appear to paralyze the heart, as decoctions of the plant are found to do. Those who chew sometimes swallow the juice; but habit renders it less dangerous, than to those unaccustomed to this narcotic. Smoking at first causes dizziness and nausea. Persons are said to have died of excess from smoking tobacco; and a person is stated to have died in Germany from excessive snuffing. The infusion of tobacco, thrown up the anus, speedily evacuates the bowels; but an infusion of an ounce or

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* Wilmer, on the Poisonous Vegetables of Great Britain.

† Corvisart's Journal de Médecine, tom. xxvi.

two has been fatal in a few minutes. Externally applied, tobacco is a powerful remedy against local rheumatic pains.

7. *Atropa Belladonna,* or Deadly Nightshade, is a strong narcotic poison. All the plant is poisonous, especially the leaves and the fruit. The symptoms produced are delirium, dilated pupils, and loss of vision. Sometimes it causes hysterical bursts of laughter, the lips, tongue, and throat are parched, there is a great sense of sinking, with tremulous movements of the hands; but convulsions are rare. Many instances of poisoning have happened from eating the berries and the young shoots. In England, in 1837, two persons were poisoned by this plant. One ate the berries, and another the root, which is more poisonous than the fruit. 180 French soldiers were poisoned by eating the berries, in 1813, at Pirna, near Dresden. The body is found, after this species of poisoning, to decay rapidly; and the seeds and skins of the berries are often found in the stomach, as they are not easily digested. The active principle is an alkaloid, *Atropia.*

8. *Datura Stramonium* is another poison sometimes employed on the Continent to facilitate robbery or rape; and in this country it has been administered by mistake. I have known two instances of poisoning by the extract of stramonium, taken by mistake for extract of sarsaparilla. In both, there was confusion of ideas, flushed face, delirium, incessant talking, and intense headach, but without vomiting. Both recovered. It owes its activity to an alkaloid, *Daturia,* which abounds also in *D. tatula.* The extract of stramonium produces dryness of the fauces, intoxication, and active delirium, with cerebral congestion.

Various *Umbelliferous plants* are poisonous; such as *Conium maculatum, Æthusa cynapium,* and *Cicuta virosa.* The roots and leaves contain a poisonous juice, and the symptoms are those of narcotics, with some degree of irritation.

9. Many authors have spoken of the *Œnanthe crocata* as very poisonous; but Dr. Christison gave it largely to dogs, without killing them. A striking instance of its poisonous

qualities occurred in Radnorshire, in 1834. Seven cows were killed by eating the root of this plant; and it proved nearly fatal to the dairy-maid, who had eaten a small piece of the same root. In Orfila's experiments, it generally killed dogs, by inducing delirium and convulsions.

10. The *Æthusa cynapium* has been mistaken for parsley: it produces dizziness, vomiting, difficulty of swallowing, and numbness of the extremities, with colic, and a livid face.

11. *Cicuta virosa*, according to Linnæus, has proved very fatal to cattle in the neighbourhood of Tornea, which in the spring greedily crop the young shoots.* It has proved fatal to man, first irritating the fauces, and then producing furious delirium, cold extremities, dyspnœa, trismus, and death.

12. *Conium maculatum* owes its activity to an oily alkaline principle, *Conia;* which smells strongly like mice, and becomes, though a clear liquid when cold, opaque on being heated gently. In the French armies, accidents often happen, from the soldiers mistaking the leaves for those of parsley. An interesting detail of this sort of poisoning occurred to Orfila, when with the French armies at Torrequemada in Spain, in the year 1812.†

13. Several of the *Ranunculaceæ* are acid and narcotic, as the *Ranunculus sceleratus*, *R. flammula*, *R. bulbosus*, *R. lingua*, *R. acris*, and *R. arvensis;* but we have no mode of detecting their poison. *R. sceleratus*, *R. flammula*, and *R. lingua*, are among the most poisonous of this genus. They appear to act merely as acrid poisons, inflaming highly the fauces and stomach; and many of the genus are capable of vesicating the skin.

14. *Caltha palustris*, another plant of this genus, has nearly similar effects.

15. *Aconitum napellus* produces delirium and stupor, with burning in the throat, vomiting, and purging. It owes its

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* Lapland Journey, by Smith. Flora Lapponica, p. 72. Amstelodami, 1737.

† T. ii. 287.

poisonous qualities to an alkaloid, *Aconitia,* which has lately been introduced into the materia medica, to allay arthritic and obstinate rheumatic pains. The dose is one-tenth of a grain. It is also used externally. Several instances of accidental poisoning from this plant have occurred in England, when the shoots have been mistaken for other vegetables.[*] Two such occurred in February, 1837; and two others, which also occurred in that year, are mentioned in the Parliamentary Report.

16. *Helleborus niger* is a narcotico-acrid poison of great activity. This is the celebrated *Melampodium* of our older pharmacopœias, once much used as a cathartic in mania and melancholia. In larger doses, the plant has proved fatal, producing delirium and violent convulsions.[†] A drachm of the extract was fatal in sixteen hours, according to Morgagni.[‡]

17. *Anemone pulsatilla,* or Windflower, is an acrid poison of considerable energy, vesicating the skin, and inflaming the intestines when swallowed. Bulliard states, that a poultice of this plant, applied to the leg, produced inflammation, ending in gangrene. *A. nemorosa* is still more virulent.[§] *A. pratensis,* and indeed the whole tribe, are highly acrid.

18. *Clematis vitalba,* or Virgin's Bower, and *C. flammula,* inflame and ulcerate the skin. With the first, beggars form factitious ulcers on their legs, to excite commiseration, and extort charity. *C. integrifolia* is a highly acrid plant, which is said to have destroyed a vast number of Prince Eugene's horses in Hungary.[‖]

Sedum acre, Stone-crop, has pretty strong acrid qualities, and destroys dogs within a few hours.[¶]

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[*] See Phil. Trans. vol. xxxviii.

[†] Bulletin de la Societé Medicale d'Emulation, 1818.

[‡] De Sedibus Morborum, Epist. lix.

[§] Gmelin, Fl. Siberica, t. iv.

[‖] Tozzeti, Sull' Agricoltura Toscana. Lucca, 1759

[¶] Orfila, t. ii. p. 190.

20. *Fritillaria imperialis* has but moderate irritant properties.

21. *Cyclamen Europæum* was considered as an acrid poison by Boerhaave; and Bulliard states, that it causes bloody stools, vertigo, convulsions, and death, in the human subject.*

22. *Plumbago Europæa,* according to Sauvages, is a violent acrid; and when prepared as a yellow dye, causes headachs to the workmen.

23. *Asclepias gigantea* and *A. vincetoxicum,* according to Orfila, kill dogs in a day or two, with symptoms of inflammation of the stomach.

24. The same qualities belong to *Hydrocotyle vulgaris, Pastinaca sativa, P. arenosa, Sælanthus quadragonus,* and *Phytolacca decandra.*†

25. *Cynanchum.*—Various species of this genus act very violently on the animal economy, especially *C. erectum* and *C. viminale.*‡

26. *Delphinium staphisagria,* Stavesacre.—The seeds of this ranunculaceous plant are peculiarly acrid, and yielded to Lassaigne and Fenuelle *Delphinia,* a fusible alkaloid, six grains of which will kill a dog in two or three hours, but, when dissolved in an acrid, in a few minutes. The symptoms are giddiness, rigidity, and convulsions. The powder of the seeds, either swallowed, or applied to a wound, kill, but less quickly.

27. *Chelidonium majus,* Greater Celandine.—A native papaveraceous plant, which, when swallowed, inflames the stomach, and has slight narcotic qualities.

28. *Ruta graveolens,* Rue.—The bruised leaves inflame the skin strongly. The root will cause abortion, with danger of high inflammation, preceded by dizziness, jactitation of the limbs, and sometimes salivation. The oil is still more violent.

29. *Cytisus laburnum.*—The seeds of this leguminous tree, I have found to be narcotico-acrid. Two cases of poisoning by them, attended with foaming at the mouth, and insen-

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* Plantes Vénén. de la France. † Orfila, t. ii, p. i. p. 97. ‡ Plenck, Toxic.

sibility, have fallen within my observation; one occurred in 1813, in a boy, who was brought to my house, in Liverpool, in a state of insensibility; the other occurred in Edinburgh, in 1833; and was attended by Dr. Omond. Both were recovered by emetics and ammonia. Since that period, Chevallier and Lassaigne have discovered in the seeds *Cytisine,* a new alkaloid, of a bitter taste, not crystallizable. Eight grains produce vomiting and convulsions.

30. *Ervum ervilia* and *Lathyrus cicera,* are two other legumes, natives of France, that are frequently mingled with wheat and rye, in bad seasons, in such quantity, as to produce giddiness, trembling, and a species of palsy, in those who feed on the grain.*

31. *Piscidia erythrina,* Dog-wood tree, is a West Indian and South American legume, possessed of active narcotic qualities. The seeds are used to stupify fish. The juice of the leaves is employed by the natives to poison their arrows. They are intensely acrid, producing burning pain in the primæ viæ, spasms, and hurried respiration.

32. *Digitalis purpurea,* Foxglove, is the only one of the *Scrophularineæ* much used in medicine. It has a tendency to accumulate in the system, when small doses are long continued. Besides its effects on the pulse, in large doses it produces vomiting, giddiness, prostration of strength, pulsation in the head, and profuse perspiration: sometimes salivation, diarrhœa, and convulsions, have preceded death. A man was killed in 1826, in London, by a decoction administered by an empiric; coma supervened, and he died in twenty-two hours. *Digitalis purpurea* owes its activity to *Digitalia,* an alkaloid which may be obtained from it. The chief characteristic of digitalis is its extraordinary power in reducing the force and frequency of the pulse; on which account it is used in medicine, but it is poisonous even in small doses.

33. *Menispermum* vel *Anamirta cocculus.*—The seeds are

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* Nouvelle Bibliothèque Médicale, t. iii.

imported from India. They contain a gray kernel, which affords about $\frac{1}{100}$ of *picrotoxia*, an alkaloid of an intensely bitter taste; 10 grains will kill a dog in half an hour. The seeds have been used to stupify fish, and, it is alleged, to adulterate beer and porter. Wepfer and Orfila found that the powder of the seeds causes in dogs speedy death, by destroying the irritability of the heart. It is dangerous to mix them with any article of food. Several men suffered from this poison in 1829, near Liverpool: each had a single glass of rum strongly impregnated with Cocculus Indicus; one died that evening, the rest recovered. The symptoms are vomiting, tormina, and finally deep stupor.

34. *Arum maculatum*, Wake-robin.—A dangerous acrid is contained in its leaves. Orfila gives the cases of three children poisoned by its leaves; they had incapability of swallowing and convulsions. Dogs are killed by it, without any peculiar symptom, except slight inflammation of the alimentary canal. The leaves are very acrid, and soon cause vomiting; but the tubers of the root, especially when boiled, are nutritive, and the large amylaceous tubers of some of the American species of arum, are prepared as food by the aborigines.

35. *Juniperus sabina*, Savine, contains, in its leaves, an acrid oil, in such quantity, that ½ ounce of their powder will destroy a dog in eighteen hours; and even when applied to a wound, will kill the animal in two days. The poison is absorbed, for in either way the rectum is inflamed. They yield an essential oil in which the acrid qualities reside. The powder and the oil are deobstruent, and have been administered to cause criminal abortion; but they often also destroy the female. In a case of this sort which I examined, the stomach was highly inflamed, and corroded in one point; the rectum and uterus were intensely red, and I found the powder adherent to the stomach. Another fatal case occurred in Somersetshire in 1837. This person was also pregnant. In several instances the female dies without aborting.

36. *Veratrum album*, White Hellebore, has been long known

to be poisonous, and Pelletier detected in it the alkaloid named *veratria*. An alkaloid very similar, if not identically the same, was obtained by Couerbe from *Veratrum sabadilla*. He supposed it to be a peculiar alkaloid; but it is not improbably a compound of veratria with water.

The powder of white hellebore root is poisonous to every species of animal. It excites violent inflammation of the primæ viæ, and injected into a vein, in the smallest quantity, it produces tetanus. Eight persons were poisoned by this powder, accidentally mixed with bread; their fauces were swelled and painful, their bowels drawn into a knot; they recovered, but suffered severely. Sometimes blindness, dysuria, dilated pupils, and stertorous breathing, have been observed.*

37. *Colchicum autumnale*, Meadow Saffron.—This plant owes its activity to an alkaloid, so similar to Veratria, that they were confounded till lately; but it is now considered distinct, and is termed *Colchicia*. The root of the plant was once employed as a very drastic purgative; but it was in disuse until the preparation sold as the *Eau Medicinal d'Husson*, a celebrated remedy for gout, reintroduced the plant into the materia medica. The wine or tincture of the root has been used, but that of the seeds is preferable, as more uniform in its strength. The preparation is poisonous in large doses, and produces symptoms very like those from hellebore. Two persons, in 1838, were killed in Kent, by taking it instead of another remedy; and in Surrey, a gentleman died from an over-dose, given during a fit of gout.

38. *Bryonia alba*, Bryony, was once in the list of materia medica, but from its excessive drastic effects, and its uncertainty, it has been long exploded. Two cases that occurred in France, are mentioned by Orfila, in which an infusion of the root was fatal in a few hours.

39. *Euphorbia*.—All the genus have a milky juice, which forms *Euphorbium*, a purely irritant poison. This substance

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* Horn's Archiv. 1825.

contains two resins, one of which seems alkaline, the other acid; both are poisonous, but the last is most active and has been termed *Euphorbiine*. In Brande's Journal* a fatal case is recorded, where the stomach was gangrened, and tore with the slightest touch.

40. *Hippomane.*—The three species of this genus found in the West Indies yield a milky juice, which is one of the most active acrids known, especially that of *Hippomane mancinella*, the manchineel of our colonies, and *H. spinosa* the *Zombi* apple of St. Domingo. It is said that rain falling off the leaves of *H. mancinella* will vesicate the skin. The exhalations from it are alleged to be fatal to those who sleep beneath its shade. This is doubted by Sir J. E. Smith, and denied by Ricord.† It seems a revival of the ancient fable alluded to by Lucretius:

> Est etiam in magnis Heliconis montibus arbor,
> Floris *odore* hominem tetro consueta necare.
>
> Lucretius, lib. vi. v. 786.

The juice seems to act as a very violent but simple irritant.

41. *Jatropha.*—This genus contains some very active poisons. The seeds of the *Jatropha curcas*, or physic-nut, when chewed, are first bland, then speedily acrid and burning. They are emetic and cathartic, causing violent tormina, inflammation, and erosion of the coats of the stomach. The inflammation often extends to the peritoneum. Similar effects are produced by the *J. multifida* and *J. gossypifolia*. This is chiefly owing to an acrid oil, which appears to be alkaline, and combined with an acid, both of which are confined to the plumula and dissepiments. The cotyledons contain a bland oil, but the volatile oil and acid are deadly poisons.

42. *Jatropha manihot*, or Bitter cassava, has amylaceous roots, the fresh juice of which has been long known to be very poisonous. Some of this juice which I obtained fresh from the West Indies, was distilled by Dr. Christison and by me, and

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* Vol. iii.

† Journ. de Chimie Médicale, i.

yielded largely hydrocyanic acid, as was first pointed out by Messrs. Henri, and Boutron Charlard.* The poisonous quality is entirely destroyed by heat, and the amylaceous matter forms the *farhina* or *casseva* of South America and the West Indies. Farhina is also obtained from the *sweet cassava,* which most regard as a different species under the name of *J. Janipha.* The juice of this contains no prussic acid. The leaves of the bitter cassava are longer and narrower than those of the sweet cassava.

43. *Ricinus communis,* Castor-oil plant.—When heat is employed in pressing the seeds of this plant, the oil obtained is much more drastic and disagreeable than when it is cold-drawn. This is owing to the rind and embryo of the seed giving out, when heated, an acrid oil, which is not contained either in the cotyledons, or is in them diluted by a large quantity of milder oil. The seeds when swallowed act with great violence, and have sometimes proved fatal. In 1837, a girl of eighteen years of age perished in Liverpool, from eating a few of the seeds of the plant.

44. *Croton tiglium,* an Indian plant, produces still more drastic seeds, which were once used in the materia medica. Of late years, the oil of the seeds has been employed with advantage; but is so powerful that a single drop is a sufficient dose. I had a patient, a very delicate lady, who usually took three drops for a dose without inconvenience. In one of the Parisian hospitals, in the year 1839, a dose of two drachms and a half, which had been ordered to be rubbed on the abdomen, was, by mistake, swallowed. The patient died in four hours, after severe pain in the primæ viæ, laborious respiration, and general *cyanosis,* as in the worst cases of malignant cholera.†

45. *Oil of Capscium.*—Thoughtless persons sometimes administer *acrid peppers,* by way of a joke, to unsuspecting individuals. This is not always safe. A man in Sussex died, in

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* Journ. de Pharm. t. xxii.

† Gazette des Hôpitaux, 1839.

1838, from a dose of a mixture of cayenne pepper and its essential oil in spirits and water, given as a remedy for ague.

Among the *Cucurbitaceæ* are some acrid poisons.

46. *Cucumis colocynthis,* which is employed in medicine, contains in the medullary part of the fruit a substance extractable by water, which is an acrid poison. Orfila gives several instances of fatal effects from over-doses of this substance, which, in one case, produced purging, colic, great abdominal tenderness, retention of urine, and priapism. A woman died in London, in 1828, from a tea-spoonful and a half of the powder of colocynth. Yet the substance, in moderate doses, is a valuable medicine, especially in combination with other purgatives. The morbid appearances produced by it are inflammation of the stomach, of the peritoneum, and, in one instance, effusion into the abdominal cavity, a consequence of the inflammation.

47. *Momordica elaterium.*—The substance called *Elaterium,* is procured by the spontaneous inspissation of the juice which exudes, without pressure, from the fruit of this plant. Even in doses of one-tenth of a grain it is violently purgative; and Orfila found that it speedily destroyed dogs when introduced into the stomach, or into the cellular tissue of the limbs. In the last instance it caused inflammation in the rectum; but the limb was tumefied and infiltrated with sanguinolent serum. Dr. Mories discovered in the juice an alkaloid, to which he gave the name *Elaterine.*

48. *Scilla maritima,* though by Orfila reckoned among poisons, is not seemingly an acrid one; it kills dogs when introduced into the stomach, or applied to a wound, but without inflaming the primæ viæ.

49. *Daphne mezereon.*—Both the root and berries are narcotico-acrid poisons. A child perished in this city, in 1838, by eating a few of the red berries of this plant. Linnæus states, that twelve berries, given for ague, destroyed a girl in Sweden, and that six berries will poison a wolf.

50. *Daphne gnidium, Daphne thymalæa,* and *D. laureola,* are also poisonous.

51. *Rhus toxicodendron.*—The leaves of this plant, and those of *R. vernix,* are acrid poisons of great energy, causing, when swallowed even in a small quantity, inflammation of the stomach. Sphacelus is said to have followed the application of the recent leaves to the skin; and if they touch the face, enormous tumefaction of the head will take place. The dried leaves are used in palsy in doses of one-half of a grain, or of one grain, two or three times a-day.

52. *Gamboge* is the gummi-resinous exudation of the *Garcinia gambogioides* and *Hebradendron gambogioides,* the last a Ceylon plant, first described by Professor Graham. It is an active poison; one drachm has proved fatal to a man; and it is the active ingredient in certain quack pills, for selling which, verdicts of manslaughter have lately been obtained against six individuals at different times.

53. *Ipomæa jalapa.*—The root of this valuable medicinal plant, in an over-dose, must be considered as poison. Cadet de Gassicourt found, that, when the powder is rubbed on the abdomen of a dog, it proved fatal by purging, in three days from the commencement of that effect. The active qualities reside in a resin, of which 12 grains will kill a dog.

54. *Convolvulus scammonea* produces a gum-resin, which, though used in medicine, may be considered as an acrid poison. It produces violent diarrhœa in dogs.

55. *Gratiola officinalis* belongs to the same natural family as Digitalis. It acts as an acrid on the stomach, and will kill a dog in twenty-five hours.* Serious accidents, according to Buchner, have happened from this plant.

56. *Lobelia inflata* possesses strong narcotico-acrid qualities. A quack in America poisoned a man by administering three doses of the powder. It is emetic, and caused in this fatal case severe

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* Orfila, t. ii. p. i. 80

pain in the abdomen, convulsions, and delirium.[*] *L. syphilitica* is less violent; but *L. longiflora* has often poisoned horses in Spain.[†]

57. *Tanacetum vulgare.* Tansy, contains an essential oil, which has strong narcotico-acrid qualities. Half an ounce taken by mistake, proved fatal to a lady in New York.[‡]

58. *Ledum palustre* has slight narcotico-acrid properties. It is said to be occasionally mingled in the north of Europe with malt-liquor, to increase its intoxicating qualities.

59. *Nerium oleander.*—Morgagni gives a fatal case from the juice of this plant. It appeared to act as a narcotic, and death ensued in nine hours.[§] The extract produces vertigo, debility, and convulsions in the lower animals.

60. *Apocynum androsæmifolium*, and several other plants of this genus, particularly *A. cannabinum* and *A venetum*, afford a milky juice, which inflames and ulcerates the skin, and seems to be an irritant poison.

61. *Cerbera ahouai*, is a Brazilian plant, of which the juice is a deadly poison. The seeds are used to poison fish. The wood gives out a powerful sort of alliaceous odour when burnt. It is a narcotico-acrid.

62. *Cerbera manghas.*—The seeds are violently emetico-purgative, and are believed by the inhabitants of India to be poisonous.

63. *Coriaria myrtifolia.*—The berries, according to Sauvages, produced violent convulsions and death in a child, within half an hour.

64. *Narcissus pseudo-narcissus*, Daffodil, has some narcotico-acrid powers. Half an ounce of the extract killed a dog in six hours.[||]

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[*] Massachusetts Reports, vol. vi. quoted by Beck.

[†] Orfila.

[‡] Beck, Elem. Med. Jurisp. ed. 2d, 527.

[§] Morgagni. de Sed. Morb. lib. iv., epist. lix. 12.

[||] Orfila, t. ii. p. i.

65. *Anagallis arvensis* is slightly narcotic; and so is *Mercurialis perennis.*[*]

66. *Spigelia marilandica* is mentioned by Beck as among the poisonous plants of America. It has evidently narcotic qualities, and is said to have caused the death of children in convulsions.[†]

67. *Symplocarpus fœtida,* Skunk Cabbage, is a violent narcotic mentioned by Bigelow.[‡] Of the same character is *Sanguinaria Canadensis* of Bigelow.

68. *Poisonous Fungi.*—Several of this natural order are poisonous, especially those belonging to the genera *Amanita, Agaricus,* and *Hypophyllum.* Their poisonous qualities appear to depend on two principles; one of which is volatile, and disappears on boiling, drying, or macerating in a weak acid. To this principle, Le Tellier ascribes the irritant quality of poisonous mushrooms. The other is not volatile, is soluble in water, unites with some acids into crystallizable compounds, and appears to be an alkaloid now termed *Fungia;* on this the narcotic properties of these plants depend. The time in which the symptoms occur, after the fungi have been eaten, is very various; often not until twelve or even twenty-four hours. The sufferers are often relieved by vomiting; but if not, the surface becomes livid and cold, violent colic ensues, and death is preceded by delirium and deep coma. The corpse is livid all over, the blood fluid, and sanguine discharges are apt to flow from the mouth, nose, and eyes. Several French soldiers were poisoned in Napoleon's Russian campaign, from mistaking *Amanita muscaria* for *A. Cæsaria.* The stomachs of those who died were inflamed, and gangrened. Many cases of this species of poisoning have occurred in these islands. A family of three persons perished in Cambridgeshire from mushroom poison in 1837; and one

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[*] Phil. Trans. vol. xvii.

[†] Beck, 567. Bigelow, Med. Bot. vol. i.

[‡] Med. Bot. vol. ii.

individual in Lancashire in the same year. About the same time, three persons of this city were poisoned by eating *Agaricus procerus*, gathered on Arthur's Seat; but they recovered, after furious delirium, oppressed breathing, feeble pulse, cold surface, and dilated pupils.

69. *Secale cornutum.*—The *ergot of rye* produces, when eaten in bread, many of the symptoms of mushroom poison. De Candolle ascribes this disease of grain to a fungus of the genus *Sclerotium;* and it has been found to yield a principle resembling Fungia. The tendency of this substance to produce dry gangrene, is generally admitted by German and French writers. There is a learned dissertation on it by Dr. Wiggers, in which its fungoid origin, and its peculiar action in promoting the expulsive efforts of the gravid uterus, seem to be established.

In an excellent dissertation on this subject, by Dr. S. Wright, he did not find that it produced gangrene in dogs: nor did it rouse the action of the gravid uterus in the lower animals, except in a single instance; but he proved that it is an active poison, producing paralysis and coma when injected into the veins, inducing emaciation, and depression of the whole nervous powers, with loss of sight, and diminished animal heat. He found that its activity resides in an oil, which may be conveniently used as a medicine to restore action of the uterus in tedious labours, to check hemorrhage and diarrhœa, and as a local application to check bleeding from wounds. The dose is from 20 to 50 drops.*

70. *Alcohol* and *Ether* may be here considered, as being derived by art from vegetable matter. They are well known narcotics, producing at first intoxication, and afterwards stupor and cerebral congestion. They are also irritants, the stomachs of persons killed by them being often inflamed. When the immoderate use of spirit does not produce death, it may give rise to *delirium tremens*. The smell of spirit is often perceived

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* Experimental Inquiry on Ergot, by Samuel Wright.

in the cavities of the chest and abdomen of those who have died from drinking. The stomach-pump and milk are the best remedies.

71. *Nitropicric,* or *Carbazotic Acid,* a substance obtained by cautious additions of indigo to warm nitric acid, has considerable narcotico-acrid qualities, as was proved by Rapp of Tübingen on the lower animals. Ten grains introduced into the stomach will kill a dog in an hour and a half. The symptoms are, tremors, contortion of the eyes, convulsions, and complete stupor. The stomach is dyed of an intense yellow; and this colour extends to all the tissues and coats of the vessels, but does not pervade the brain or spinal cord.

Another acid, nearly similar, the *Nitro-anilic,* is obtained from the same materials, in different proportions.

72. *Camphor,* a concrete essential oil, has pretty strong narcotic qualities. There are two kinds of camphor known in commerce: the common, produced by distillation from the stem and roots of *Laurus camphora;* the other found in the interstices of a large forest tree, *Dryabalanops camphora.* This last sort in China bears seventy times the price of the common sort. Camphor, from Mr. Alexander's experiments, has considerable energy; and in fatal cases from an over-dose, the stomach has been found inflamed. It is best detected by its peculiar odour.

VII. ANIMAL POISONS.

1. *Cantharides.*—An acrid poison is contained in the body of the *Cantharis vesicatoria.* It is found to reside in a whitish matter, resembling spermaceti in colour and consistence, which is united to three other marked principles. The first is a green oil, soluble in spirit, but not in water; the second a blackish matter, soluble in water, but not in spirit; the third a yellow viscid matter, soluble both in water and spirit. This last is united in the insect with *Cantharidine,* and renders it soluble in water, which it is not when pure.

The symptoms of poisoning by catharides are, intense burning heat in the primæ viæ, painful deglutition, pain in the stomach and bowels, bloody vomiting, painful micturition and priapism, intense desire to void urine, and distressing pain in the whole urinary organs: frightful convulsions and tetanic spasms usher in the fatal termination. When the flies have been swallowed in substance, the fragments of their green *elytra* are found adhering to the villous coat of the stomach; and these have been observed even after the body has been buried for months. There is no antidote for this poison. Evacuants and mucilages are the best remedies. Oil given by the mouth increases the evil, by dissolving the cantharadine; but oil thrown into the bladder is useful in allaying the irritation.

2. *Fish-Poison.*—This singular subject is little understood, except that, in certain seas, and in certain seasons, fishes at other times wholesome, prove deadly poisons. This is chiefly the case with the *yellow-billed sprat*, the *barracuta*, the *gray snapper*, and *gray labrus* of the West Indies; with several species of *Diodon* and *Tetrodon*, and with *Aplodactylus punctatus* of the Southern Ocean.

The fishes in which poisonous qualities have been chiefly observed (in the West Indies) are:—

1. Clupea thryssa—Yellow-billed Sprat.
2. Esox barracuta—Barracuta.
3. Sparus venenosus—Gray Snapper.
4. ——— chrysopus—Porgee.
5. Scorpæna Scrofa—Poisoned Grooper.
6. Labrus griseus—Gray Labrus,
7. Anguilla Conger—Conger Eel.
8. Scomber regalis—Kingfish.
9. ——— pelamys—Bonito.
10. ——— carangus—Green-backed Cavallo.
11. ——— hippos—Horse-eye Mackerel.
12. Balistes monoceros—Unicorn fish.
13. Coryphæna hippurus—Coryphene, or Dolphin.
14. Diodon orbicularis—Globe Diodon.
15. Tetrodon lævigatus—Smooth Tetrodon.
16. ——— sceleratus—Poisonous Tetrodon.
17. ——— ?—A small Tetrodon.

(In the Southern and Indian Ocean,)
18. Tetrodon ocellatus—Canton poison-fish.
19. Aplodactylus punctatus—Spotted Toad-fish.

Some West Indian Crustacea are also sometimes poisonous, as *Cancer ruricola,* or land-crab. But the fish-poison is the most virulent, and most frequently met with. The fishes are more poisonous on certain stations than on others. Thus, they are particularly so to the leeward of Gaudaloupe, Antigua, Santa Cruz, and St. Christopher.

The rapidity and fatality of the poison has been described by Chisholm, Ferguson, and Thomas.* The symptoms are, irritation in the throat, tingling of the surface, burning heat in the stomach and bowels, colic, nausea, spasms, giddiness, coma, and death. It is said that persons have died while masticating a portion of the fish, ere any of it were swallowed. The juice of the sugar-cane, and various sweet liqueurs, are said to be useful in the slighter cases.

Fishes in this country are sometimes poisonous; and mussels have occasionally, with us, produced death, with less rapidity, but with symptoms of the same kind.

Mussels, with us, are more frequently poisonous than fishes. *Musseling* is not unfrequent; and feeding on the common mussel, *Mytilus edulis,* is sometimes fatal. Dr. Combe describes the effects on thirty persons poisoned by this food at Leith in 1827, two of whom died.† They strongly resembled the symptoms of some kinds of fish-poison in the West Indies, or those of Vancouver's seamen in *Poison Cove,* on W. coast of North America.‡ Oysters, too, in this country, have occasionally been observed to have poisonous qualities.§ The *Helix pomatia* has been found poisonous in France.||

The cause of the poisonous quality of fish is, with some pro-

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* Edin. Med. & Surg. Journ. iv.—Trans. Royal Soc. Edin. ix.—Memoirs of Lond. Soc. vol. v.

† Edin. Med. & Surg. Journal, xxix.

‡ Voyage, iv.

§ See cases adduced by Dr. John Clark in Lond. Med. Trans. for 1814.

|| Mém. Soc. Médicale de Lyon, 1810.

bability, attributed to their having fed on acrid mollusca. The small fish, such as *Clupea thryssa,* are more frequently poisonous than the larger species; which are believed to become poisonous from having fed on that sprat, a favourite food of many other fish. No difference in their appearance distinguishes the poisonous from the wholesome fish of the same species.

3. The flesh of birds is occasionally poisonous; as happens to the *phasianidæ* of North America, when they have fed on the buds of the *Kalmia latifolia.* Several persons were dangerously ill at Philadelphia, and one died, soon after eating the flesh of *Tetrao cupido,* in 1792.* It is said that the flesh of hares which have fed on *Rhododendron chrysanthemum* and *ferrugineum* has poisoned those who fed on it.†

4. The honey of bees, in like manner, is poisonous, when they have fed on the sugar of the *rhododendron* and *kalmia,* as is described by Xenophon, Pallas, and Dr. Smith Barton. In the former case, the honey produced a species of madness; in the latter case, the symptoms are similar to what occurred to the soldiers of Xenophon. Xenophon states, that, on the arrival of the *Ten Thousand* near Trebison, the soldiers found many bee-hives, but those that ate of the honey became as if intoxicated, or as overthrown in a flight. They all recovered on the following day.‡ The poisonous honey of Heraclea, in Pontus, is also mentioned by Aëtius. Pallas states, that, in the country of the *Abassines,* "the famous maddening honey is produced;" and he ascribes this quality to the bees feeding on the flowers of *Rhododendron ponticum* and *Azalea pontica.*§ Dr. Smith Barton describes the very poisonous honey of New Jersey in the American Philosophical Transactions.‖ It appears to derive its narcotico-acrid qualities from the bees feeding on the flowers of the *Kalmia latifolia,* and congenerous plants.

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* Mease, New York Med. Rep. vol. i.

† Beck, Edin. Med. Jurisp. p. 524.

‡ Anabasis, Δ. tom. ii. 251. Foulis' edit.

§ Travels, i. 386.

‖ Vol. i.

5. *Animals have a poison generated in them by disease,* which is capable of infecting those who eat, or even touch their flesh. The best known instances of this are in the *pestis bovilla* or *murrain* among domestic animals, by which their flesh and juices become deadly poison to other animals. This appears somewhat analogous to the accidents that happen in dissection.

The *Malignant pustule,* arising from eating the flesh, or even having the juices of animals affected by murrain applied to the human skin, is a most formidable disease. A good account of it is contained in the treatise of Enaux and Chaussier,* and the instances they give of its fatality are very striking. Persons have died of it in three or four days. There is another description of the disease in the Inaugural Dissertation of Davy la Chevrie.† These authors describe the two varieties of malignant pustule, the *Prominent* and the *Depressed;* the last of which ends more quickly in gangrene, preceded by *phlyctenæ,* filled with a brownish sanies.

6. *The bites of rabid animals* belong to the same class of poisons. The bite, for instance, of a rabid dog, will destroy other animals: after some time they become delirious, then paralytic, and die rabid. In man, similar symptoms occur, to which is superadded hydrophobia;—a symptom never observed by Mr. Youatt in any animal except *man.*

Rabies appears to be primarily derived from the bites of rabid animals of the genus *Canis;* but by their bite it may be communicated to the cat, the horse, the ox, the sheep, the pig, and to man. The poison is only communicable through the saliva: the saliva of a rabid ox was found by Youatt to produce rabies in a dog inoculated with it.

The most usual morbid appearances in man are marks of inflammation about the medulla oblongata, the cervical nerves, and upper part of the par vagum. This accounts for the oppression and laborious respiration. There is always some degree of inflammation about the epiglottis, and upper part of the trachea. The stomach also has patches of inflammation, both in man and in the lower animals. The cicatrices of the wounds, in fatal cases, are observed to have inflamed anew, and to have a brown gelatinous fluid under them. Excision of the wound, or destruction of the part by caustic, is the best prophylactic; *Belladonna, Scutellaria lateriflora,* and the leaves of *Buxus sempervirens,* which are narcotic, seem to have some preventive power, according to the same authority; and excessive bleeding seems to have arrested or cured the disease in India. Doses of 2 grains of the leaves of *Atropa belladonna* were employed by Brera, and have been highly extolled in Prussia, where the disease, especially in the vicinity of the Silesian forests, is frequent. Wolves are subject to the disease, and have often extensively communicated it to man. Youatt, who has had much experience of the disease among the lower animals, recommends for dogs, a mixture of leaves of belladonna and scutellaria, in the proportion of 2 grains of the first to 40 of the latter, for a dose, twice a-day. He says that this has prevented rabies in dogs bitten by rabid animals. He has operated, he states, on more than 400 persons bitten by rabid dogs, and never lost one patient by the disease, to whose wounds he had used lunar caustic; yet, in most of these cases, he did not see the patient until twenty-four hours, many not for a week, and two not for a fortnight, after they were bitten. Excision of the wound is said even to have caused the commencing symptoms of the disease to disappear. After excision, the cupping-glass should be applied; or, where excision is impracticable, enlarging the wound, and abstracting blood freely by the cupping-glass, as recommended long ago by Celsus, should be employed:—"Utique autem si rabiosus canis fuit, cucurbitula vires ejus extrahendum."*

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* Méthode de traiter les Morsures des Animaux enragés. Published at Dijon in 1785.

† Published at Paris in 1807.

7. *Bites of Snakes.*—Poisonous snakes are provided with two

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* Celsus, lib. v. cap. xvii. 1, 2.

or more teeth placed on a moveable bone, situate on each side of the upper jaw, and corresponding to the superior maxillary bones of other animals. These teeth or fangs are hollow, and have their roots connected with a duct that conveys the poison from a bag placed under the principal muscles that close the jaws; so that, when the animal bites, the poison is squeezed from the bag, and is instilled, through the hollow of the fangs, into the wound. The symptoms, in general, are in proportion to the quantity of the poison, compared to the size of the animal bitten; the smallest animals suffer most. The general symptoms are, pain in the part wounded, trembling, weakened respiration and circulation, and coma. The most poisonous snakes are the *rattle-snake* of America, and the *cobra de capello* of India; the *viper* of this country and of France sometimes produces fatal accidents.* Excision of the part, sucking, or cupping the wound, are to be tried; and both ammonia and arsenic, given internally, appear to have considerable power in curing the bites even of the most deadly snakes.

Various plants are said to have considerable power as antidotes; among these *Eupatorium mikania* or Guaco, *Aristolochia anguicida, Cissampelos pareira, Fevillea cordifolia,* and *Eupatorium aya-pana,* are the most generally considered as efficacious. In one plant, the American aborigines place great faith, according to Silliman, not only as an antidote, but to protect them against the rattle-snake, to which the smell of the leaves, or some of its sensible qualities, appears to be very intolerable: this is the white ash, *Fraxinus Americana.*†

8. In the male *Ornithorynchus paradoxus,* we find, on the posterior extremity, a spur, perforated by a minute tube, like the fangs of a snake, and connected with a poison gland and duct; an apparatus capable of inflicting a dangerous wound.

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* For an account of the poison of snakes, see Mead on Poisons; Fontana sulle Venene; Dr. Patrick Russel's Account of Indian Serpents, 2 vols. folio, London, 1796; Paulet, Sur la Vipère dite de Fontainbleau, Paris, 1806; Philosophical Transactions, 1810. In this last is an account of a young man who died from the bite of a rattle-snake in London, in 1809.

† See Silliman's Journal for 1833.

The stings and bites of Arachnidæ and Insecta, are poisons of a similar kind.

9. *The Scorpion* has, in the last joint of its tail, a poison-gland connected, by means of a duct, with the hollow sting. The animal, when running about, always carries this joint bended, so as not to wound itself. When seized, it strikes with the tail, which is long enough to extend beyond its head; and when it seizes large insects, it wounds them with its sting, before bringing them to its mouth. Bontius states, that the sting of the large Indian scorpions renders persons raving mad. The scorpions of Africa are large, and their sting is greatly dreaded. There are three distinct species of scorpions in Europe, the stings of which produce violent pain, erysipelatous inflammation, and swelling in the wounded limb, but are not fatal to the larger animals. I have two species of a large size from Singapore: the *Scorpio Americanus,* the smallest of all, is quite a different species from all the scorpions of the old world, and has lived with me, in England, for several months.

The most judicious treatment of such wounds, is to extract the poison by the cupping-glass, to apply ammonia and water externally, or to bathe the part with *Eau de Luce,* and to administer the same remedies internally.

10. *Scolopendra morsitans.*—I am unable to find any specific difference between the large scolopendræ of India, South America, and the West Indies. An enormous scolopendra came alive in a ship from Jamaica to Liverpool; it could extend its body to more than a foot in length, and could take considerable leaps. I caught a large scolopendra in Andalusia, in Spain, entirely like those of Demerara in size, and the number of its feet. It was found at a great distance from the sea and human habitations; so that, probably, the *S. morsitans* is common to every quarter of the globe.

The poison of the scolopendra is secreted near the root of its strong horizontal pincers, and is conveyed through these tubular fangs to the wound. The bite of *S. morsitans* gives rise to severe pain, and inflammation, and is much dreaded in our tropical colonies. The smaller species of our island are incapable of injuring a texture so tough as the human skin.

11. *The spider* has fangs very similar to those of the scolopendra, which are very fatal to flies; but the very large spiders of hot climates, particularly the *Mygale avicularia* of the West Indies and India, are capable of inflicting very troublesome wounds. A curious instance of the virulence of the poisonous bite of a single spider, is given in the American Journal of the medical Sciences for 1839. A gentleman received the bite in a water closet, and was immediately in agony; his head and neck became swelled and livid, he had general spasms, with great dyspnœa, and violent vomiting. He was freely bled by Dr. Hulse and got laudanum, camphor, and ammonia. The species of spider is not mentioned, but it is stated to have been large, brown and hairy. The bite of the *Tarentula* of Naples is now known not to be formidable; and Serrao has disabused the medical world on the pretended cures of *Tarentism* by dancing.

12. *Argas Persicus.*—This animal, familiarly described by travellers as the *poisonous bug* of Meeaneh and Tu Derwar, is not a Cimex, nor even an Insect; it belongs to the order of the *Arachnidæ,* having eight legs, and is furnished with a sucker, by which it attacks persons who lodge in the old mud houses in the villages of Persia, infested by it. My friend Dr. Charles Bell, on going to Persia, was requested by me to inquire into the truth of the alleged poisonous qualities of this animal; and he confirms the accounts of Morier and other travellers, as to the severe febrile state produced by the bite. He sent me several of the animals, among which Mr. M'Leay, our eminent entomologist, recognised the *Argas Persicus,* and a nondescript of this same genus. The bite produces low fever, from which the persons slowly recover. It has some resemblance to typhus. The Persians affirm that the bites are often mortal.

13. The wounds inflicted by the *Bee* and the *Wasp* are produced by a very complex apparatus, consisting of two barbed

darts moving parallel to each other in a horny sheath. The poison is secreted in the last abdominal ring of these insects. The sting is moved by a complex system of muscles, which are described by Swammerdam. The sting is found in the queen and the labourers (neuters, or imperfect females,) not in the males. When it penetrates so tough a substance as the human skin, it is often left behind, and increases the irritation of the wound; but the chief cause of that irritation is an extremely acrid poison, which flows in a groove between the darts, on the compression of the poison bag connecting the glands with the sting. All know the pain occasioned by the sting of the bee; but it is not so generally known that this poison may prove fatal to man, or even to larger animals. Amoreux thinks it is only when they are attacked by a swarm that this poison proves fatal; but he states instances where a single sting from *Apis terrestris,* or the Humble Bee, produced inflammatory tumours, and which, like carbuncle, required deep incisions to arrest their progress. Orfila quotes a case where a man of thirty years of age lost his life, in 1765, from the sting of a bee over his eyebrow. Our celebrated traveller Mungo Park, in his last journey, lost several of his baggage asses, by the stings of a swarm of bees; and the horse of a traveller in America, was killed in ten minutes, by an attack of the bees of two hives which he had overturned.*

14. The bites of several blood-sucking insects are apparently poisonous, such as those of the *Termes bellicosus, Formica hamata, F. Cephalotes,* the *Ichneumon, Tabanus, Œstrus,* and *Culex.* The common gnat, or mosquito, *Culex, pipiens,* has a very complex apparatus beneath the neck, which conceals several minute darts; and during the operation of sucking, an irritating liquid appears to be infused into the wound. The an-

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* Silliman's Journal, 1820, case of Rev. Ralph Leeming. [Fatal cases are given by Dr. Mease in the American Journal of the Medical Sciences, for Nov. 1836. See, also, an article by the same gentleman, "On Stings and Bites of Insects," in Dunglison's American Medical Intelligencer, for Aug. 15, 1838.]

noyance from this species of fly can only be duly appreciated by those who have visited hot damp countries, or made a summer visit to the primeval forests of Lapland and North America. I know one instance where the bites of gnats in Demerara produced so much irritation and fever, as to render it necessary for the young gentleman to return home to Europe.

VIII. IMAGINARY, PRETENDED, AND IMPUTED POISONINGS, require much patience and attention on the part of the medical jurist: to them no general rule can be applied, but they must be treated according to the nature of each particular case. Asking the persons complaining to detail their case, and describe the progress of the symptoms minutely, will often lead to the detection of pretended poisoning. Curious instances of this are given by Tartra, p. 243, and Dr. Christison, p. 94. Of imputed poisoning, some curious instances are detailed in Dr. Christison's work, p. 95.

Orfila has detailed the best methods of detecting attempts to impute poisoning to another by injecting acrid poisons into the anus of a dead body. If this be done during life, the traces of inflammation extend beyond the immediate contact of the poison, and gradually become more faint; but if the person has been previously dead, the acrid matter either leaves no traces of its action or if injected soon after death, leaves a well defined redness where in contact with the tissues.*

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* To those who desire a more detailed account of poisons, I would strongly recommend the precise and luminous Toxicology of my colleague, Professor Christison; a standard work, which should be in every medical library.

PART II.

MEDICAL POLICE.*

SECTION I.—CIRCUMSTANCES AFFECTING THE HEALTH OF INDIVIDUALS.

I. Cleanliness.—This subject may be considered under three heads.

1. *Personal cleanliness* is valued by all nations in proportion to their advance in civilization, and exercises an important influence on the health of individuals. Most savage nations are disgustingly deficient in this virtue; but the polished nations of antiquity paid great attention to it, as is evinced by their general use of baths, the stupendous ruins of which still surprise us in the remains of their cities. In modern times, especially in Great Britain, warm and cold bathing are far less employed than is desirable; and we cannot help regretting the want of public baths for all ranks, especially in our manufacturing towns, where the luxury of warm or tepid bathing might be very cheaply obtained, by collecting the waste water from the *condensing backs* of steam-engines. Bathing by removing sordes and remains of perspiration, keeps the skin in a fit state for its important func-

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* The writings of the elder, J. P. Frank, contain much valuable information on Medical Police. The first work alluded to is his "System einer Medicinischen Polizey," which appeared, in five volumes, at Manheim, between 1779 and 1788; the second is his "Annalen der Medicinischen Polizey," in thirteen volumes, from 1791. See also Hygiéne Publique, par M. Marie Tourtelle, tom. ii. Strasb. 1813.

tions. Public baths should be established in every town; and all children should be taught to swim.

The *cold* bath is the immersion of the body in water at any temperature betwen 32° and 65°. The most agreeable cold bath is in the open sea. Cold bathing is most beneficial to the young and vigorous; it is not advisable for persons subject to plethora or hæmorrhagies, to inflammations, dyspnœa, or any species of cachexy; but it is generally salutary to most other persons. Some persons, when warmed by exercise, sit down to cool before using the cold bath: this is an error as was well shown by Dr. Currie.* In such circumstances, the temperature usually falls below that which is natural to the human body in health; and it would probably be less hurtful to bathe in the sea immediately after severe exercise, than to wait until both the animal heat and the force of circulation are below the natural standard. I can, from experience, say, that the cold bath is most agreeable when the exertion has been continued to the moment of the immersion; and that if one does not remain *long* in it, no ill consequences will flow from a person in vigorous health plunging into the sea when in profuse perspiration. This is contrary to the opinion in modern times, but it accords with the practice of the ancient Spartans and Romans, and is confirmed by the habits of the northern nations of Europe in modern times, who make an instantaneous transition from a vapour bath at 130° or 140°, into ice-cold water, not only with impunity, but with great benefit to their health.†

The effects of the cold bath are tonic and stimulant, especially when the shock of immersion is sudden, although the long continued application of cold may be sedative. When a bath ranges from 80° to 90°, it is termed *tepid*. This species of bathing is very salutary in preserving the healthy state of the dermoid surface. If not used in excess it is not unduly relaxing to the solids, but is very refreshing after fatigue, or for debilitated persons. Immersion in water above 95° is considered as a *Hot Bath.* Few skins can bear the contact of water above 107,° and even at 98° water feels very warm to the general surface of our bodies. The warm bath is very beneficial to persons as they advance in life, and is useful after excessive fatigue. The Romans made much use of hot baths, and probably carried it to excess; but Galen and other ancient physicians considered the use of the warm bath as one great means of prolonging life. Its efficacy in rheumatism, gout, and many other affections, is well known; and the comparatively small use which is made in modern times of this luxury is much to be regretted. The artificial warm bath is in most instances as efficacious as natural thermal springs. I am not aware of any impregnation of thermal springs, except when sulphuretted hydrogen is contained in the waters, that has any decided superiority, in the cure of disease, over an artificial hot bath.

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* Medical Reports, vol. i. chap. 12.

† [This is dangerous doctrine, and is opposed to the inculcation given by the author a few lines before, that a person, warmed by exercise, ought not to sit down to cool before using the bath. Perspiration is the resolution of heat, and danger must accrue from the cold bath when the person is in a profuse perspiration in all cases, perhaps, unless when the vital manifestations are exalted to the degree in which they are known to be by the Russian vapour baths.]

The warm and vapour baths of northern Europe prove how cheaply such luxuries might be obtained for the great mass of the community. Although the human skin cannot bear water at a higher temperature than about 107° as a bath, yet it can sustain a temperature considerably higher in the vapour bath. What is called the *Finnish* or *Russian Vapour Bath,* is a small apartment heated by steam, which is produced by the effusion of water on stones or earthenware at a red-heat. I found the temperature, during the hour which I remained in this species of bath at Hamburg, ranging from 126°.5 to 136°.5; but I was unable to examine the thermometer when the bath was hottest. Such baths are well described by Acerbi, who states, that he found their temperature = 70° or 75° Centigrade, which would = 158° or 167° F.* This vapour bath is always concluded by a copious cold douche. I have found this a powerful febrifuge in common catarrhal attacks. It is very beneficial in chronic rheumatism, and in arthritic stiffness of the joints.

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* Travels through Sweden, Finland, and Lapland, vol. i. 297; Lond. 1802. See also West of England Medical Journal, No. 3.

2. *Domestic cleanliness* is perhaps better understood by the Dutch and the English than any other nations in the world. This virtue has been long practiced in Holland but is comparatively only of late origin in Britain.* The picture which Erasmus draws of English manners is not very flattering; and our own historians prove that it was not until after the civil wars of the 17th century that the English became a cleanly people.† The progress of domestic comfort is also well illustrated, as keeping pace with the increase of national wealth, in the "Brief Observations" of Sir Josiah Child. Now no nation can surpass them in domestic cleanliness, and none equal them in domestic comfort. The effect on the health of the inhabitants is shown by the less frequent attacks of severe epidemic diseases in modern times, and perhaps also by the increased value of life annuities.

3. *Ventilation of Habitations* is one important part of domestic economy, now better understood; and Strutt, Sylvester, and Murray have taught us how ventilation may be combined with warmth. The renewal of the air, vitiated by respiration and combustion, is secured by simple contrivances, and the air admitted into apartments is warmed by passing between a close stove or cockle and an exterior covering.

A beautiful statistical contrivance for opening and shutting ventilators and windows, by the variations of temperature in the air of the apartment, is given in the Library of Useful Knowledge, under the article "Thermometer and Pyrometer," the contrivance of Dr. Cumming of Denbigh; and also an invention for the same purpose by Mr. Kewley. The beautiful self-regulating stove of Dr. Arnot adjusts the quantity of air admitted to the fuel, and consequently the heat to the temperature of the room.

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* See Lady M. Wortley Montague's Letters, and Mrs. Radcliffe's Travels.

† Erasmi Epistolæ, Hollingshed's Chron.

II. Aliment.—Under this head may be considered,

1. *Preparation of Food.*—Alimentary matters are rendered more wholesome and nutritive by cooking; and the mystery of that art is not unworthy of consideration, even were it not also the means of economizing the sustenance, and increasing the gratification of man.

2. *Culinary Utensils* deserve attention here, because the wholesomeness of aliment is often materially affected by them. There is risk in cooking food, especially of the acescent or oleaginous kinds, in copper vessels, though the danger is diminished by keeping the utensils always bright, and not suffering the food to remain in them after removal from the fire. The presence of copper, especially in pickles and preserved vegetables, may be ascertained by the taste; by placing a clean knife in them which soon will become tinged with a film of copper, if the quantity be considerable; or by digesting them with vinegar, filtering, and adding ammonia, which, if copper be present, gives a blue tint to the liquid. Vessels of lead and pewter should be entirely banished from the kitchen, as they are never without danger, from the ease with which they are acted on by acids. The presence of lead is best detected by boiling the suspected aliment with vinegar, filtering the liquid, and passing a stream of sulphuretted hydrogen through it. Tinning copper vessels renders them safe, as long as the coating of tin lasts; but the vessels usually made of pewter, an alloy that contains lead, should be replaced by those of block tin, or of tinned iron. Boiling vinegar in a tinned copper vessel is a severe test of the perfection of the coating of tin, which, if defective, will tinge the vinegar with a salt of copper.

Vessels of pewter are chiefly employed as measures for fermented liquors, or other fluids, when retailed. This has arisen from the ease with which they can be accurately turned on a lathe to the standard size.

Rieman's proposal to cover culinary vessels of copper with enamels, will not obviate the danger, because enamels are very liable to crack when heated, and thus expose the surface of the copper to acescent food. Since the discovery of laminating zinc, this metal has been employed as vessels for the dairy, for cisterns, and water pipes. Zinc easily oxidates, but this defends the surface against farther action; and except for the acid food, or where heat is employed, such vessels are useful and wholesome. They are said to cause cream to separate more readily from milk than earthenware vessels; and they are more easily kept clean, and are lighter than wood. Zinc, on account of its lightness, is much employed, instead of lead, on roofs, and for pipes to carry off water. It answers well for these purposes, and is not dangerous, but it is not lasting. The objection to vessels of tinned iron is their little durability, and the lead solder with which they are put together. Vessels of iron are durable and cheap, but they blacken some kinds of food; this is best obviated by a coating of tin. Vessels of gold and silver are far too expensive for ordinary use; but copper is often covered with a thin plate of silver, forming what is termed plated ware, which is excellent while the silver remains on the copper. A thinner coat of silver is applied, in some instances, by means of an amalgam of silver, and a similar process is commonly used to gild the inside of silver or of plated ware. What has been termed *German silver*, is made of various alloys of copper and other metals, as with tin and antimony, or with nickel. This has nearly the splendour of real silver; but is readily acted on by acids, and therefore not suited for culinary purposes, even if it could be had at a cheap rate.

Pottery is a valuable addition to culinary utensils. It is of all qualities, from the purest porcelain of China or of Europe, to the coarsest earthenware. The glazes which contain lead are objectionable, where acids are to be used, but if well baked, such glazes are not readily acted on. In La Mancha in Spain, much use is made of course brown earthenware for culinary utensils. This is more to be regretted, as the Spaniards consume much acescent vegetable food. I found a colic, resembling that produced by lead, there not uncommon. Dr. Beck mentions two instances of families suffering severely, from the use of fruit preserved in coarse earthenware, with a lead glaze.* Weak acids boiled in such ware act on the glaze, and yield a distinct trace of lead to sulphuretted hydrogen. The glaze of our common stoneware is formed of 40 lbs. of siliceous sand, 75 of litharge, 26 of potassa, and 10 of common salt. This is formed into a frit, is levigated and diffused through water, into which the *biscuit*-ware is dipped, and then baked, to semivitrefy the glaze. For chemical experiments the porcelain of China or of Germany, in which there is no lead, is always preferred; and it would be so also for culinary purposes, but for the expense. These glazes are made with felspar, or with mixtures of flint and alkalies. Equal parts of nitre and pounded glass with flint have been used as a glaze. Common salt and sand or powdered flint have also been employed. Pumice with $\frac{1}{32}$ part of oxide of manganese, was D'Arracq's glaze. Feilner of Berlin recommended 5 parts of pure siliceous sand, and 4 parts of carbonate of soda. The British mountains yield a fine felspar, which makes an admirable glaze. The purest parts of the compact felspar of Wales, and the flesh-colour common felspar of Benachie in Aberdeenshire, form a very rich pearly-white glaze for porcelain.

3. *Adulterations of Food* may be accidental or designed. We have just stated how lead and copper may find their way into food, but there are other accidental adulterations. Farina, or flour, may be rendered unwholesome by the presence of the *ergot*, the *smut* of wheat, and the seeds of *Ervum erervilla, Lathyrus cicera*, and *Lolium temulentum*, which act as narcotics. Flour may also be mixed with sand, from the use of too soft mill-stones; with other impurities, from want of care in winnowing or grinding; or by fraudulently adulterating with chalk and gypsum. Bread may be mixed with chalk; magnesia, potassa, soda, or alum, to conceal bad flour; and it has been sometimes adulterated with white lead. These adulterations are easily detected. On rubbing down the bread into a pulp with water, the solid particles will subside to the bottom, and

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* Elem. Med. Jurisp. 479.

may be collected; the alum, alkalis, or lead, may be detected by chemical tests.

Some foreign writers have stated, that the bakers of London occasionally add subnitrate of bismuth to bad flour, for the purpose of converting it into marketable bread. It is a ridiculous fable; for that substance is too dear, and will not produce the desired effect so well as many cheaper materials. The alleged addition of jalap, to counteract the effect of alum in their bread, is just as absurd. Some person who has seen a baker forming the children's purge, *jalap ginger-bread-nuts,* has fancied that this mixture was intended for general consumption. Carbonate of ammonia is now used, instead of pigeon's dung, to cause flour, which would otherwise make *sad bread,* to rise well. Sometimes carbonates of alkalis, and of magnesia, are employed for the same purpose.

It is now well known that the panary fermentation produces a large quantity of spirit, which is lost in ordinary baking; a discovery by Professor Graham (now of London) in 1826. Mr. Hicks, of London, has a patent for the saving of this spirit, by adapting the capital of a still to a closed baker's oven. The spirit comes over, during the baking of the bread, and is condensed in a worm in the usual way. It is economical only to use the best flour, which generally will thus yield about $\frac{1}{64}$ of its weight of proof spirit. The bread is excellent from the quality of the flour. The heat of the oven should range, during the baking, from 350° to 380°, and towards the end to 400° F.

Butcher meat may be unwholesome from disease in the animal, or by long keeping. Unwholesome meat must not, under certain penalties, be exposed for sale in our markets. Game is often eaten in a state approaching to putrefaction. This is relished by some; but it is a capital error to keep it so long. Before cooking it, tainted game may be deprived of the odour by rubbing it with charcoal powder, by burying it in the earth, or washing it with a weak solution of chloride of soda, or of lime.

The juices of over-driven cattle appear to be poisonous.

Wounds to which their blood is applied are apt to be affected with dangerous inflammation; and pricking the hand with the bones of a hare, in skinning it, has been known to produce troublesome erysipelas*, but cooking destroys this poison.

The poison of the German sausage appears to be owing to a species of putrefaction in that article, by which an acid, somewhat analagous to the sebacic acid, is formed, and united with an acrid oil. Buchner has examined this acid, and finds, that, though it does not redden litmus, it unites with alkalis, and is separated unchanged by other acids. It has been called sausage-acid. A minute portion causes severe and long-continued dryness in the throat. A single sausage afforded him 40 grains of this substance, which is the poisonous ingredient in the sausage.

The symptoms it produces are dryness in the throat, with many of the symptoms of musseling. A good account of this singular affection is contained in several German publications.† Similar effects have been produced by decomposition in cheese, which are described by Hünefeld, of Griefswald, Westrumb of Hameln, and Sertürner, of Eimbeck.‡ The latter proves the presence of two acids, the sebacic and caseic in such cheeses. Prout had shown that the flavour acquired by old cheese depends on the gradual conversion of *caseine* or curd into caseate of ammonia, the acid being united in sound cheese to excess of ammonia, and the escape of the latter during keeping, suffering the acid to be evolved. The cheese then becomes soft, interspersed with hard lumps, is of a deep yellow, and of a flesh-red when heated with nitric acid. Dr. Geisler§ has described a case of poisoning very analogous, which arose from eating *rusty* bacon, and probably had a similar origin.

Butter may be deteriorated by containing too much salt or water. These adulterations are easily detected by melting the butter, which will separate the other ingredients from the oil. It has also been adulterated by flour, chalk, and, it is said, by white lead. The same process will separate them; and the appropriate chemical tests will detect the frauds. The fresh milk of cows, and especially of goats, has produced poisonous effects in France and in Germany.* The cause is obscure, but has been supposed by Marc and Orfila, to arise from some new principle evolved in milk by a vital process.†

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* [Dunglison's Elements of Hygiene, p. 111. Philad. 1835.]

† See two Memoirs on Sausage Poison by Dr. Kerner, Tübing, 1820, and 1822; De Veneni Botulini Viribus et Natura, by Dr. Dann, Berol. 1828; De Veneno in Botulis, by Dr. W. Horn, Berol. 1828; and also in Edin. Med. Surg. Journ. vol. xxxiii.

‡ Horn's Archiv. für 1828.

§ Rust's Magazine, t. xvi.

Water may be unwholesome or disagreeable from corrupting animal or vegetable matter; and from being too hard, that is, containing too much saline or earthy ingredients. Soft water may be adulterated by passing through leaden pipes, or standing in cisterns of that metal. Water is never presented by nature in a state of absolute purity. It always contains saline and earthy matter in solution, with some atmospheric air, and often carbonic acid. These impregnations, in moderation, render it wholesome, and more palatable than distilled water. Running water, especially from springs, is generally preferred for the use of Man. Stagnant water, when it contains much vegetable matter, is unwholesome; and that of marshes should never be employed for culinary purposes. Hard water, that is, water containing much saline matter, does not answer well for boiling animal or vegetable food, nor for washing. All adulterations of culinary water, by the drainings of manufactories, should be considered unwholesome.

Milk is adulterated in cities by the addition of water, sometimes by chalk, magnesia, or flour. Chalk is easily detected by subsidence, and the test of an acid to the residue. Magnesia, in small quantity, thickens thin cream, and gives it the taste and appearance of a richer article: magnesia is said to be often used in large cities for this purpose. The addition of muriatic acid will coagulate the milk, and dissolve out of it the magnesia, which may be thrown down by carbonate of soda. The adulteration with flour is generally made by boiling a portion of milk with the flour, which is soluble in the serum, and then adding this to thicken and improve the appearance of thin milk. This may be injurious to young infants. It may be detected by a drop or two of tincture of iodine. The first milking of a cow affords a very thin, watery milk, but the last drawn from the udder is very rich; and thus milk, of different qualities, may be obtained at each milking, from the same cow, without any adulteration of the natural milk by *water*.

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* Archives Generales, xv.

† [In the western portion of the Union, a disease prevails, termed "Milk Sickness," which is said to be produced by eating the flesh, or butter, or drinking the milk of the cow, when in a peculiar pathological condition. See Graff, in Amer. Journal of the Med. Sciences, April, 1841.]

Malt liquors have been purposely adulterated by *Cocculus indicus, Lolium temulentum, Sedum palustre Asarum Europæum,* &c. to increase their intoxicating qualities. It would be unjust to accuse brewers, as a body, with intentional adulteration of their manufacture; but the temptations to substitute a cheap for an expensive article, are too powerful for some persons. It has often been supposed that porter owes its dark colour and flavour to other ingredients than malt and hops. Highly dried grain is used as a colouring matter; but the existence of a class of persons named *Brewers' druggists* gives rise to suspicions that other materials are employed in preparing that dark liquid. Any impregnation from the copper kettles employed in boiling the wort must be very small, if the vessels be well kept; as it is necessary to empty the kettles immediately when the wort is sufficiently boiled.

Stale beer is sometimes dulcified by adding chalk, magnesia, or potassa. These are not dangerous, but they render the liquid vapid.

The chief adulterations of spirit are by water; and by lead, accidentally introduced from the worms of the stills. Water is detected by the hydrometer. Lead is readily thrown down by infusion of galls, which will deprive new spirit of its unwholesome qualities.

Wines are adulterated by brandy to give them strength.

The addition of spirit is injurious to the flavour of wines, and is not required for generous wines. Wines, when just fermented, have a pale colour, and various artifices are used to give them particular tints. The best wines are only dyed by the colouring matter expressed from the husk of the grape; but many *red* wines are coloured by the berries of Elder, *Sambucus nigra*, of *Vaccinium myrtillus*, or by logwood, *Hæmatoxylon Campechianum*, &c. The correction of acidity in white wines is attempted by sugar, by sun-dried raisins, or by *dashing* them with sweet wines; the acid is sometimes neutralized by chalk; but a much more serious adulteration is perpetrated when litharge or sugar of lead is employed for the same purpose. The same is sometimes employed to dulcify red wines. This adulteration has long been held a capital crime in some parts of Germany, and can scarcely be too severely punished. Lead thus employed may be detected by a test similar to that proposed by Hahnemann, viz. a solution of tartaric acid impregnated with sulphuretted hydrogen. Before applying this test to red wines, they may be deprived of colour by heating them with milk, and then filtering the liquid to which the test is to be applied. Arsenic, iron, and antimony have sometimes found their way into wines, from the process of sulphuring the cask before the wine is put into it, and may be detected by their usual chemical tests. This last ingredient is best detected by the test consisting of a solution of tartaric acid, impregnated with sulphuretted hydrogen.

Vinegar is liable to contain lead and copper, from the pipes and cocks through which it flows. These metals are easily detected by sulphuretted hydrogen and ammonia. Alegar, when mixed with true vinegar, may be detected by adding some soluble preparation of lime, which will throw down the phosphoric acid that alegar contains. Sulphuric acid sometimes adulterates vinegar, and is detected by hydrochlorate of baryta. Hydrochloric acid may be detected by nitrate of silver; when in large quantity, it may be detected by acetate of lead.

III. Police of Apothecaries' Shops.—The supply of good drugs is regulated, in many countries, by the Government. Inspectors are appointed, who examine and report on the state of the drugs found in the premises of dealers, and any infringement of the laws is rigorously punished. In our country the inspections are a mere form, of little or no utility. They should be made by persons paid by the State, and competent to the task, whose office should be honourable.* Among various improvements, it would be to the advantage of the public, if no person who prescribes medicines, were suffered to have any interest, directly or indirectly, in the sale of drugs. When the prescriber is also the vender, it holds out a strong temptation to one of the worst species of fraud,—that of giving much more medicine than is for the benefit of the hapless patient. Every medical man who prescribes a secret remedy of his own, should forfeit his grade in the profession; and the dealing in quack nostrums should be wholly interdicted. Levying a tax on quack medicines, is unworthy of an enlightened Legislature: the *letters-patent* are represented by the charlatan as a reward for his discovery, Pecuniary fines will scarcely restrain quackery, for knavery will soon be enabled to repay it from the sums levied on folly and credulity. Rigid imprisonment, and correctional forced labour, would be the best methods of putting an end to the impostures of quacks, from whom the health and purses of the good people of this country have long suffered most enormously.

IV. Clothing.—The importance of paying attention to the qualities of clothing, is generally admitted. The advantage of flannel or cotton next the skin, to persons of a consumptive habit, or of otherwise delicate constitutions, and also to soldiers and sailors, or other persons whose occupations are laborious, is acknowledged. The use of linen next the skin is suitable for the young and robust; but as persons advance in life, cotton or woollen under-garments are advisable.

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* See Remer's Lehrbuch der Polizeilich-gericht-lichen Chemie; or the translation by Lagrange and Vogel. Paris, 1816.

In various parts of Europe, governments have absurdly restricted private individuals to certain limits in the cost of dress, or in its shape or colour. With us, the only persons with whom our laws interfere in this respect, are our warriors, the inmates of some of our seminaries, work-houses, and prisons. The dress of our soldiers and sailors should be such as give them the freest use of their limbs, while it defends them against the atmospheric changes, to which they are so frequently exposed. How little attention is paid to those obvious principles, is apparent in the uniforms of several of our regiments; as for instance, in the extravagant weight of the high bear-skin cap, or plumed Highland bonnet, and in the poor defence for the loins and hip-joints against wet and cold, in the form of the jackets of our soldiers. The advantage of woollen stockings in long marshes, is well known; and the health of the soldier is greatly promoted, by the attention of his superiors to see that his extremities are guarded against the effects of cold and moisture.

The attention of the officers in the navy to the clothing of their men, has had a happy influence on the general health of our seamen, especially when exposed to extremes of temperature.

1. The *Male dress* should afford sufficient protection to the parts it covers, and should not impede the free use of the limbs. The covering of the head should defend the eyes from excess of light, and the head from the sun. Any thing tight about the neck is injurious. Those who take much exercise will find useful support from broad belts round the waist; especially as they advance in life.

The *Female dress*, should keep the body comfortably warm. Compression of the chest and abdomen of females is far too general; and the ribs of most of our modern belles are deformed by tight lacing.

The general form of a well-made female lies within the limits of two cones, joined by their bases about the hips. This is different from the figure of the male of the human subject, whose greatest breadth is across the shoulders. This difference in the general form of each sex, is finely illustrated by contrasting the Venus de Medici with the Belvidere Apollo; or by a glance at Raffaello's exquisite figures of Adam and Eve. In these unsophisticated forms, the widest part of the female thorax is at its bottom. How these differ from the form of a modern British beauty it is unnecessary to point out, where tight-lacing and whalebone have done their worst to pervert the true form of woman.* This practice diminishes the cavity of the chest; it confines the stomach and liver excessively, and has also a tendency to contract the width of the pelvis. By the first, consumptive diseases are induced; by the second, the function of digestion is injured; by the last, the perils of child-bed are increased. The practice of tight-lacing is ancient. It is severely stigmatized by Terence:

> Haud similis virgo est virginum nostrarum, quas matres student
> Demissis humeris esse, vincto pectore, ut graciles sient.
> Si qua est habitior paulo, "Pugilem esse" aiunt: deducunt cibum:
> Tametsi bona est natura; reddunt curatura *Junceas.*
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> *Eunuc.* ii. 3, 21.

It is reprehended by all modern authors. Spigelius strongly condemns this practice of compressing the chest, and lauds the Venetians, among whom an ample chest in either sex is esteemed a beauty. In his day, it would appear that the British, above all nations, were addicted to this absurd practice.† Mr. Lawrence, in his "Essay on Hernia," has some admirable remarks on the same subject. Fortunately, the pelvis is less within the power of bad habits to distort than the ribs; yet its brim is sometimes injured by the pressure of tight stays.

Excessive exposure of the bust is also too general among women, and often lays the foundation of disease, especially in our changeable climate. The shoes and stockings also of females are incapable of resisting wet, or even damp; and, in general, there is no proportion between the defences of our men and of our women against cold; so that it is not wonderful they should suffer from rheumatism and inflammations.

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* See Soemmering on the Effects of Stays. Dr. Barlow on Physical Education.

† Spigelius, De Humani Corporis Fabricâ. Lib. i. c. ix.

V. Temperance.—Its importance to health, to vigorous youth, and to honoured age, need not be insisted on. Gluttony is not less destructive, and is even more disgusting, than drunkenness: both are sure to end in debasement of the mental faculties, and destruction of the bodily health.

There are some admirable observations on the good effects of temperance in Galen; in the amusing little work of Marquese di Cornaro; in Cheyne's "Art of Preserving Health;" in the writings of Dr. Falconer of Bath; of Dr. Rush of Philadelphia; the "Treatise on Prolonging Life," of Hufeland of Jena; and in the interesting "Anatomy of Drunkenness" of the late Dr. Macnish.

The most pernicious excess of this nature is in spirituous potations; as has been admirably pointed out by Rush and Falconer; and Sir Gilbert Blane and Captain Forrest, R. N., have clearly pointed out the advantages which have resulted from the regulations in our service, since half the allowance of spirit was commuted into coffee or cocoa. The same was long ago indicated by Sir John Pringle, in his work "On the diseases of the Army," by Rollo, by Sir George Ballingall, and several other of the medical men of our army and navy.

The evil consequence of excess in spirituous liquors is so generally acknowledged, that perhaps we may consider distillation as the most pernicious discovery which chemistry has imparted to the human species. How much may be generally done to limit the consumption of spirit, and to beget more sober habits in our population, it is perhaps too soon yet to infer from the efforts of what are called *Temperance Societies,* and by the benevolent exertions of such men as Father Matthews.*

VI. Exercise.—Regular exercise in the open air is highly conducive to health; and those who are interested in the improvement and happiness of the lower classes in our towns, cannot help lamenting the little that has been done to encourage our artizans and shopkeepers to take out-door exercise in pure air.

The philanthropist must remark with regret, the contraction of the means of enjoying fresh air, which the enclosure of commons and of waste lands near towns and villages, has produced, and the discouragement, by officious magistrates, of the outdoor games and pastimes of the lower orders. Part of the sums so frequently left to endow hospitals and alms-houses, would be more rationally expended on gymnasia for the encouragement of healthy sports in the open air, or on public walks for the recreation of our citizens.

The gymnastic exercises of the Greeks, and the trainings in the Roman Campus Martius, were professedly for the object of improving the vigour of their youth, and supplying the state with a band of hardy defenders, inured to exercise, and patient of fatigue. Even in such a view, the encouragement of manly exercises in the open air, among the population of our manufacturing towns and our villages, is worthy of the consideration of the patriot, and, on the score of health, is not beneath the attention of the legislator. There is one species of exercise which has never enjoyed with us the encouragement which it deserves, I mean the *Art of Swimming*. Its utility is so obvious, its value to the soldier and sailor, on many occasions, so apparent, and the numerous lives which might annually be saved were the art more general, are circumstances which render it matter of astonishment that it forms no part of the *instruction* at any of our public institutions in these islands.

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* [The good effects of these exertions is strikingly shown by the records of the largest eleemosynary Institution in the vicinity of this city, from which it appears that the number of patients, especially of females, labouring under delirium tremens has diminished surprisingly.]

VII. Prostitution.—In most parts of the Continent, the state has interfered, not, as is falsely alleged by some, to raise a revenue from this polluted source, but to secure the rising generation, as much as possible, against the fearful consequences of vices that sap the foundations of a nations strength, by impairing the sources of a healthy progeny. The unfortunate class of females, who may generally be considered as the victims of male licentiousness, are there regularly registered, and subject to domiciliary visits of the authorities, who send them to hospitals, when disease first makes its appearance. The arguments against this practice, are not more rational than it would be to forbid the medical practitioner to lend his aid in other cases, where the imprudence of the sufferer was the cause of his malady.

This subject, which exerts a very powerful influence on society in all large cities in particular, has never met, in this country, with the attention it deserves. The causes and consequences of the legislation on it, in other countries, have been totally misunderstood, or wilfully misrepresented. The bearings of the question of a sanatory police, in such cases, is deeply interesting to the legislator and the moralist; but it has never been philosophically considered, until the posthumous publication of M. Parent du Chatelet.* Some useful remarks on it are also contained in Fregie's book, "Sur les Classes Dangéreuses."† Parent's researches into the manners, habits of thinking, and statistics of public prostitutes, were undertaken with the laudable design of obtaining accurate information on the most certain means of ameliorating the condition of this unhappy class and recalling them to the paths of virtue: and though he professes only to treat of *Prostitution as it exists in Paris,* the principles he establishes, and the means of alleviation of its numerous evils which he proposes, are universally applicable. He points out the general causes which produce it; the classes in society from whence prostitutes chiefly are derived; their general state of ignorance, and the vices of their parents; their deep sense of their own degradation; the diseases to which they are chiefly liable, and their final lot; the errors in the well-meant efforts of those benevolent persons who have attempted their reformation; and numerous other curious circumstances in the statistics of prostitution, which had escaped former inquiries. The principal causes of the ruin of females are, the villany and profligacy of the male sex; the very inadequate wages of females who subsist by their needle, and other manual sedentary employments; the precarious nature of their employments; the congregation of young persons of both sexes in manufactories; the arts of the procuress, vanity, and the love of dress. More than one-half of all those in Paris appear, however, to have been driven to prostitution by sheer want, or by the abandonment of their seducers.

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* Tom. ii. Paris, 1836.

† Tom. ii. Paris, 1840.

In France, since the system of registration and regular inspection by the police surgeons was established, disease has greatly diminished both in the number of its victims, and the virulence of its symptoms. I had an opportunity of making the same remark in Hamburg, where the same regulations are adopted.

In France, the tax levied on brothels and courtezans, (which never exceeded £3800 annually, a sum far below the expenses of the *Dispensaire de Salubrité*) was abolished in 1828, as obnoxious to misrepresentation, and the cost is now paid by the state, or by the municipality. The Dispensaire, which was first established under the ministry of Fouché, remains, and is now admirably conducted.

VIII. Celibacy and Marriage.—In the most polished states of antiquity, marriage was enjoined by positive enactments, and enforced by penal statutes; in modern times, legislators wisely leave it to the sense and discretion of individuals. In fact, the propensity to celibacy is so small in most persons, that marriage may be safely intrusted to individual will. Montesquieu pointed out, why in new countries, where the means of subsistence are easily procured, persons uniformly marry very early.* The tendency to increase and multiply is so forcible, that it will generally be found to produce a population up to the very limit of the means of providing for children. It was for advocating this philosophical truth, and for pointing out the natural checks to a redundant and miserable, because destitute population, that Malthus has been abused by sciolists and pretended philanthropists, who appear, from their senseless declamation, either never to have read his works, or not to have comprehended their import.

Lord Bacon has very quaintly, but forcibly, expressed the advantages and disadvantages of matrimony.† No writer has given a stronger testimony in favour of matrimony than Hufeland.

IX. Lactation and Care of Offspring.—The important duty of rearing the helpless infant devolves by nature on the female parent; and in general it can never be so well performed by any other individual. In an artificial state of society, however, many females become mothers who are not able to nurse their children. In such cases, we would recommend the employment of a wet-nurse, as affording the best chance of rearing the infant. The child should not be long fed *exclusively* from the breast; because its stomach should be gradually accustomed to other food before it is weaned. The infant is totally dependent on the care of those around for its preservation. To retain it healthy, it should undergo daily ablutions, have its clothes of suitable warmth, easy, and frequently changed. Its food should be chiefly of milk and farinaceous matter for the first two or three years. It should have regular exercise in the open air; and not be confined in its early years to too sedentary occupations.* The dreadful mortality in foundling hospitals proves the importance of the circumstances alluded to under this head.

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* L'Esprit des Lois. 1. xxiii. c. 10.

† Essays, Civil and Moral, Works, iii. 360.

X. EFFECTS OF PROFESSION AND TRADE ON HEALTH.—This is a a very important consideration, and may be divided into various heads.†

1. *Diseases incident to affluent idleness* are chiefly such as arise from indolence and want of some definite object of pursuit; hypochondriasis, tædium vitæ, dyspepsia, gout. For such persons, the best remedies are rural amusements, intellectual pursuits, mingled with sufficient inducements to take exercise in the open air.

2. *Diseases of Literary Men* are chiefly produced by want of attention to regular exercise in the open air, giving rise to dyspepsia and constipation; by irregularities in the time of eating and sleeping; and by excessive use of the eyes in artificial light. They are best obviated by abridging the hours of study, and mingling sedentary avocations with active and social occupations. Literary men, however, especially in France, have been a long-lived caste.

3. *Clergymen* have a wholesome intermixture of sedentary with active duties; and, if their lungs be sound, they are generally long-lived.

4. *Lawyers,* when their occupations are chiefly at the desk, are subject to the diseases of sedentary persons; but barristers, when not excessively harassed by toil, may generally be con-

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* Underwood's Directions to Mothers.—Hamilton on the Management and Diseases of Infants.

† See Ramazzini, "Diatribe de Morbis Artificum," and Thackrah's "Effects of Arts, Trades, and Professions, on Health," Ed. 2d. London, 1832, for valuable information on this subject; and also some papers of Parent du Chatelet in "Annales d'Hygiène Publique."

sidered as engaged in a healthy occupation. Many of our judges attain extreme old age.

5. *Medical Men,* from the general activity of their pursuits, their knowledge of the causes that promote health, and the wholesome exercise of mind and body induced by their profession, are generally considered as a long-lived class: but in this, as in other learned professions, small account is made of those who die before they have become known, of those who pine away from penury and hope deferred, or whom a desire to better their condition sends abroad to perish on inhospitable or pestilential shores. Yet taking the whole together, the medical profession is certainly favourable to longevity.

6. *Schoolmasters, Clerks,* &c. are subject to the usual diseases of sedentary persons, and to those produced by passing a great part of the day in vitiated air, with the sternum leaning on a desk. Such persons should live at some distance from the scene of their labours, that they may be compelled to take exercise in the open air.

7. These observations apply also in some degree to *Merchants,* to *Master-manufacturers,* and *Shopkeepers:* but a British merchant has, when successful, an enviable life. The morning is dedicated to business, and the afternoon to his family and friends; while his home is usually remote from the crowded streets, in which his counting-house is necessarily placed.

8. *The Shopman,* however, generally leads a very different life. He is late and early in the shop, the whole day is spent in serving customers, and in many instances, his hours of rest are abridged by the duties of his business, which afford him no time to take exercise in the open air. This is peculiarly hard on young persons, perhaps sent from the country to be immured in the smoky atmosphere of a crowded, narrow street. Multitudes of both sexes annually fall victims to this change.

9. *Soldiers and Sailors,* when they escape the perils of training to their laborious occupations, are often healthy, if temperate, and if care be taken of their health by their superiors. Their ailments frequently arise from their own intemperance,

as much as from the casualties of their calling. Excessive fatigue is certainly unfavourable to longevity; and when we find very old persons in this class, we may attribute it in a great measure to the *iron*-nature of constitutions, which have enabled them to resist the hardships to which they must have been subjected in their younger years. Soldiers on duty are more exposed than sailors to wet and cold, to unwholesome climates, and to bad fare. A sailor carries with him his provisions and his change of raiment; and in the British navy he has much attention paid to his health while on board his ship. Long marches are apt to produce diseases of the hip-joint, and hernia, especially in young soldiers.

The evil effects of the anticipated conscriptions in the time of Napoleon were fearfully exemplified in France; "they encumbered the road-sides and the hospitals," as he once admitted. The too early employment of youth in military duties is condemned by Barons Percy* and Larrey,† by Coche,‡ by Sir James Macgrigor,§ and by all writers on diseases of soldiers. The great mortality among young recruits in India has been pointed out by Ballingall,‖ Ainslie,¶ Annesley,** and Marshall,†† who considers that no soldier should proceed to our Indian possessions before the age of twenty-one. Dr. Burke‡‡ has expressed similar views; and in a valuable publication by Kirckhoff,§§ physician to the Dutch forces, it is stated, that no recruit ought to be received into the army till he has completed his twentieth year.

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* Dictionnaire des Sciences Médicales.

† Memoirs de Chirurgie Militaire, et Clinique Chirurgicale.

‡ De l'Operation Médicale du Recrutement et des Inspections Générales.

§ Medico-Chirurgical Transactions, vol. vi.

‖ Diseases of European Troops in India, and Outlines of Military Surgery.

¶ Asiatic Journal for 1828.

** On the Diseases of India.

†† On the Enlisting, Discharging, and Pensioning of Soldiers.

‡‡ Report of the Commissioners of Military Inquiry.

§§ Hygiène Militaire.

The sailor is also liable to hernia, from strains in the course of his laborious duty. Sailors are subject to inflammatory diseases of the chest, and to dyspepsia, from the use of indigestible food, such as salted meat, with few fresh vegetables, but still more from the abuse of tobacco. When long kept on salt provisions, they are likewise liable to scurvy.

10. *Agricultural Labourers* have generally a very healthy occupation, when the returns of their industry afford them sufficient aliment and comfortable clothing. Their situation is much more favourable to health than that of the town-mechanic. The same may be said of carters, postillions, and coachmen; except that the latter are often exposed at night to the inclemencies of the weather, and are not always remarkable for sobriety.

11. *Quarrymen and Stone-masons* are liable to serious injury, from the minute dust they create entering the air-passages along with their breath. This often gives rise to a species of consumption; and such persons are seldom long-lived. It affects the stone-masons of Scotland more than those of England: the former work under sheds, the latter in the open air. Marble-cutters, for the same reason, are unhealthy; and even the employment of a sculptor cannot be considered as a good one for a person of delicate lungs.

12. *Carpenters and Joiners* exercise healthy trades, because they require activity, and are freely exposed to the air in many of their operations. It is very different, however, with artizans whose trades are chiefly carried on in a vitiated atmosphere.

13. The trade of the *Weaver* is always rather unhealthy, from his working in a confined space; but the introduction of machinery has reduced the pittance of the hand-loom weaver below what can support life with any comfort, and his habitation is proportionally wretched. There is in this occupation exercise to the limbs; but the breast leans against the beam, which, with wretched fare, and depressed spirits, renders the trade of the weaver unfavourable to health.

14. *Milliners and Tailors* are confined in hot, and ill-ventilated rooms; they work too many hours in the day, and often have their natural hours of rest greatly abridged. Milliners are liable to become short-sighted, and the practice of biting the thread generally injures their front teeth. The lives of young females are often sacrificed to this business. Tailors assume a faulty position whilst at work; and the consequence is, that, when they walk, they have a peculiar strut; the increased power imparted to the muscles of the back, from long supporting the weight of the head, causes the shoulders to be preternaturally drawn back. They are also very subject to phthisis.

15. *Shoemakers* are more healthy; but the pressure of the last against the sternum and stomach is sometimes injurious.

16. *Miners and Well-sinkers* are engaged in laborious trades, in which they are exposed for considerable periods to breathe a vitiated atmosphere; and are farther liable to the bad effects of inhaling dust, which predisposes to asthma. The inhaling of coal-dust gives rise to a species of spurious *Melanosis*, which we sometimes see in our hospitals; and Dr. Forbes states, that the miners of Cornwall are subject to chronic bronchitis, "from the inhalation of dust."*

Well-sinkers are liable to vertigo and dyspnœa, the consequences of working in impure air; and in France, the same class of persons have sometimes been suffocated in clearing out the *fosses d'aisance* of that capital.

17. Artizans working amidst *putrid animal matters* seem more liable to plague and typhoid fevers than most other classes.†

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* Translation of Laennec.

† [Putrid animal exhalations would seem, however, to affect the health but rarely. It has been affirmed by many observers, that the "Knackers" or *Chantiers d'Equarrisage*, whose occupation it is, in the large cities of Europe, to convert the dead horse to various useful purposes, are unusually healthy, although their operations are described as horribly offensive. The men, indeed, in the establishment at Montfaucon near Paris, are described by Parent Duchatelet, (Hygiène Publique, Paris, 1836,) as enjoying the most flourishing health, the women as

It would appear, however, that persons who work among *greasy* matters are not liable to contagious diseases. Candlemakers, though liable to dyspnœa, are said often to escape the plague; and tanners, also, though much among putrifying matters are generally considered as healthy. Perhaps the anointing of the skin produced by the vapour of tallow, and the emanation from tannin, are able to counteract the deleterious influence of the putrid emanations.

Persons exposed to Acid Fumes, and to Chlorine, are liable to dyspnœa and irritation of the air-passages; but habit has surprising effects in allaying the latter. It is curious that in chlorine manufactures, persons usually become lean in a short time, though otherwise seemingly healthy.

18. Artisans exposed to inhale *minute particles of dust* are very liable to pectoral diseases. This is especially the case with knife and needle grinders. They are subject to the disease called *grinder's rot,* an incurable consumption, which renders this occupation most deadly. Currents of air, and interposed plates of glass, have been used to remedy the evil. Large magnets have been employed to arrest the iron-dust; but it cannot abate the dust from the grind-stone itself which is not less fatal. Good essays on this disease have been published by Dr. Johnstone of Worcester in 1796, and by Dr. Knight.* The latter states, that, out of 2500 grinders in Sheffield, there were only 35 who had lived to 50 years of age; and not perhaps

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most fruitful, and the children as pictures of healthful energy; and he adds that the workmen were remarkably exempt from diseases during the prevalence of Cholera in Paris. M. Parent also expresses his conviction, that there is no ground for the belief that dissecting rooms are *foyers* of morbid emanation; and in support of this position he adduces many facts, as well as the decided opinions of Lallemand, Desault, Dubois, Dupuytren, Boyer and many others; he states, moreover, and he brings forward the testimony of M. Andral, Mr. Lawrence and others, in confirmation thereof, that there is no disease whatever to which students are attached to, and employed in dissecting rooms, are liable from exposure to the cadaveric emanations.]

* In North of England Medical Journal.

double that number who had reached 45; but of 80 fork-grinders, who used the *dry stone*, it was stated that there was only one who was so old as 35 years.

19. *Workers in lead, brass, and copper*, &c. are subject to disease, from those substances finding their way into the system, as already stated.

The fumes of *mercury*, especially in *wet-gilding*, are exceedingly apt to produce ptyalism, tremors, and, finally, confirmed mercurial palsy. It would also appear that the vapour of mercury is very injurious to the lungs. Jewellers and gold-workers are liable to sustain injury, chiefly from the fumes of *charcoal*, which are not sufficiently guarded against in their workshops, which are, moreover, hot and ill ventilated; hence arise dyspnœa, vertigo, and dyspepsia.

20. *Bleachers and Dyers* are liable to suffer from acrid fumes in some instances, and also from sudden changes of temperature. With these we may class practical druggists, who also suffer in their health from inhaling dust, in pounding acrid or poisonous substances.

21. *Snuff-makers and Millers* are exposed to dust, and the former to the consequence of inhaling also a narcotic; but the effect is seldom very marked on either. Parent du Chatelet thinks that snuff-making is not an unhealthy occupation, as he has observed it among the snuff-makers of Paris; but this does not agree with what I learntat the Royal Tobacco Manufactory at Sevilla, in which there were ninety-two mills for grinding snuff. The men were said to be liable to coughs, and the mules employed in moving the machinery to the *staggers*.

22. *Chimney-Sweepers* are liable to consumption, and to a peculiar cutaneous disease, the *chimney-sweeper's cancer*, which chiefly affects the scrotum. Early excision removes it; but it is liable to recur. There is an excellent paper by Mr. Earle on this disease, in vol. xii. of the Medico-Chirurgical Transactions. It rarely attacks those under 25, and it is most common between the ages of 30 and 40. One case occurred in a child of 8 years. The children employed as climbing boys are subject to diseases

of the chest, from the irritation of soot entering the bronchial tubes, and often to severe injuries from the brutality of their masters; and it is earnestly to be wished that the Legislature would put a final stop to this most barbarous mode of cleaning chimneys, which is a disgrace to any civilized Christian community.

23. *Cotton, silk, and flax spinning* by machinery, expose the operatives to bad air, dust and confinement in hot rooms. This is especially injurious to the young, who are much employed, from eight years and upwards in such manufactories. The hours of work of all classes in them are too long. Woollen factories seem to be less unhealthy on the whole; but in them the employment of very young children, and to long hours of labour, is to be regretted.

By the Parliamentary Reports of 1834, the number of persons employed in the cotton manufacture in Great Britain amounted to 100,495 males, and 119,639 females, or to 220,134 persons, of whom 28,771 are children between the ages of eight and thirteen years. The spinning and weaving of silk in Great Britain employ 10,188 males, and 20,494 females, or 30,682 persons, of whom 9,074 or about one-third are children between eight and thirteen years of age. The woollen manufacturers employ 37,477 males, and 33,797 females, or 71,274 persons of whom 13,322 are children between eight and thirteen years. Spinning and weaving of flax employ 10,395 males, and 22,888 females, or 33,283 persons, of whom 5,288 are children from eight to thirteen years of age. So that these four branches of British industry give employment to 355,373 persons, of whom 56,455, or about one-sixth are children.

24. *Persons exposed to a high temperature,* such as *Cooks, Confectioners, Bakers,* are liable to rheumatism, from sudden changes of temperature. Bakers were remarked to be the most general victims of the plague at Marseilles in the beginning of the last century. *Sugar-refiners* are exposed to much heat, and to sudden chills. *Smelters of iron* and other ores are subject to the same; to cough, from dust, especially if they

are founders; and their eyes become weak, from the intense glare of the metal. *Glass-blowers* not only suffer from these causes, but also from the excessive exertions of their lungs, which often give rise to hæmoptysis and asthma.

SECTION II.—CIRCUMSTANCES AFFECTING THE HEALTH OF COMMUNITIES.

I. Climate.—The effect of climate, the most general of these circumstances, depends chiefly on the temperature, the hygrometric state of the air, and the general force and direction of the winds. The temperature of any place is well known to depend in a great degree on its latitude. The inclination of the earth's axis to the plane of its orbit has diffused the influence of the sun's rays more extensively over the surface than if the same points had always a vertical sun. The changes in temperature had been marked long before there was an instrument for measuring their extent, and hence the distribution of the earth's surface into parallel zones denominated *climates;* but the invention of the thermometer showed how ill this arrangement accorded with observation; and it was soon found that there were very different climates under the same parallels. The average or mean temperature is obtained by a series of thermometrical observations, carried on in the open air and in the shade. Large springs and deep caverns usually have the mean temperature of the place where they occur; and it has been found that a series of observations made every hour through April will give a pretty accurate mean temperature of that place for the whole year, especially in western Europe.

Temperature, however, is also considerably modified by longitude. Thus it is found that the mean temperature of any latitude in western Europe is higher than that of the corresponding latitude in eastern Asia, or in America, as may be seen by casting the eye over Humboldt's chart of isothermal lines. A comparison of similar observations indicated to Sir David Brewster that there were, in each continent, certain meridians on which the mean temperature is the lowest in that parallel. These he termed the *cold meridians*, in approaching to which the mean temperature falls on either hand.

But the principal circumstance which modifies the effect of latitude is elevation above the sea. As we ascend mountains, the temperature falls; and in every region, if its mountains be sufficiently lofty, they are the abodes of perpetual congelation. The limit varies with the latitude: it is highest under the equator, and diminishes as we approach the poles: thus, at the equator, the point of perpetual congelation is more than 15,000 feet above the sea; in Britain it is about 5500. The climate of a place, then, varies with the latitude, with the longitude, and with the elevation.

Even when the mean temperature is the same, places may differ greatly in the extremes of heat and cold in summer and in winter. The chief agent in equalizing heat is the ocean, the temperature of the mass of which remains nearly the same in all latitudes. This renders the summers of islands less hot, and their winters less cold, than those of continents under the same parallels. The peculiarities of climate affect the vegetable productions of a country, and its salubrity is greatly modified by the nature of its surface. A region shrouded in forests is generally colder than one exposed to the rays of the sun; and the exhalations from swamps and marshes materially affect its fitness as a residence for man. Such countries are subject to violent intermittent and remittent fevers, especially when the marshes are acted on by intense solar heat; and in tropical regions such places are pestilential.

The peculiarities of climate produce marked effects on the vegetable productions of every region; and this has given rise to the investigation of the *physical distribution of plants,* a subject which has engaged much attention since the publication of Humboldt's memoirs and inquiries into the laws which appear to regulate the succession of vegetable forms in different climates. He has divided the northern hemisphere into six isothermal bands, each distinguished by some vegetable production of use to man. Each of these *Isothermal Bands,* with very few exceptions, extends to considerably higher latitudes in the old than in the new world; but the eastern side of Asia, and western side of America, more nearly approximate in mean temperature than Europe and the latter continent.

I. This Isothermal Band is the region of Palms and Bananas, with a mean temperature above 77° F.; limits in O. W. Lat. 32°—in N. W. Lat. 23° 30′.
II. Region of the Citron, with a M. T. from 77° to 68°; limits in O. W. Lat. 37° to 38°—in N. W. Lat. 29°
III. Region of the Olive and Vine, with a M. T. from 68° to 59°.
IV. Region of the Vine, Wheat, and Evergreen Oak, with a M. T. from 59° to 50° 71′; limits in O. W. (Europe) Lat. 52° 25′, (China) Lat. 40°—in N. W. Lat. 42° 25′.
V. Region of the Cerealia, with a M. T. from 50° to 41°; limits in O. W. Lat. 60°—in N. W. Lat. 48° to 50°.
VI. Region of the Pine, Birch, and Willow, with a M. T. from 41° to 32°; limits in O. W. (Europe) Lat. 71°, (Asia) Lat. 66°—in N. W. Lat. 57° 8′.

The influence of elevation above the sea on vegetation was well pointed out by Tournefort, in his "Travels in Asia Minor;" by Wallenberg, in his "Flora Lapponica;" by Ramond, in his "Examination of the Pyrenees;" and by Humboldt, in his "Examination of the Equinoctial Andes," who thus distinguishes the zones as the traveller ascends."

I. The region of Palms and Scitamineæ; rising to 5600 feet above the sea.
II. Region of Arborescent Ferns and true Cinchonæ; the first rising to 4800 feet, the latter to 8700 feet.
III. Region of Oaks, commencing at 5800 feet, and reaching to

IV. Region of Shrubs; Trees disappear at 10,800 feet, and are succeeded by shrubby plants.
V. Region of Alpine Plants, which commence at 6100 feet, and continue to 12,600 feet.
VI. Region of Gramineæ, which continue until the elevation exceeds 14,200 feet.
VII. Region of Byssi and Lichens; it extends to the very verge of perennial ice.
VIII. Region of uninterupted Congelation, which extends from 15,700 feet to the towering summits of the Andes.

The modifications which climate undergoes, and their influence on the vegetable kingdom, and on the health of man, is well illustrated in the natural history of Mexico, and of the Neilgherry Mountains in southern India.

The effect of climate in producing diseases is sufficiently proved by the unhealthiness of the hot pestilential places at the feet of those mountains, compared to the salubrity of the climate at a moderate elevation on their sides. The influence of swamps, when acted on by heat, in producing intermittent and remittent fevers, is among the most generally received instances of the dependence of some diseases on peculiarities of climate. This has been too fatally illustrated by the formidable remittent fevers contracted by our armies in the East and West Indies, and the swamps of Walcheren, by the effects of the *malaria* of the coasts of Italy, and the prevalence of ague in the fenny counties of England. Several other diseases appear to depend on climate, as the *goîtres* and *cretinism* of the Alps and other mountainous countries, the elephantiasis of Africa and the West Indies, and the strumous affections of cold climates.

The prevalence of the goitrous enlargement of the thyroid gland among the Alps, has been well described in the "Voyages dans les Alpes" of Saussure. It sometimes forms a tumour, weighing from six to seven pounds, and then it is not only a great deformity, but impedes respiration. Among the Swiss Alps it is sometimes accompanied by a much more serious evil, a state of lamentable idiotism. These persons are termed *Cretins*. They are generally marked by large, deformed heads, and feeble, ill-developed limbs. All *cretins* are *goitrous;* but there are numerous persons with the thyroidal enlargement, who have no taint of cretinism. In fact, the latter has no absolute connexion with the former; for the goitrous tumour is very frequent where cretinism is unknown. It is frequent in the close valleys of the South American Cordillera, among the Himalleh Mountains of India, and is not unknown in the vicinity of Lyons in France, among the Pyrenees, in Derbyshire, and in some parts of Devonshire. Spix and Martius met with it, as a very common disease, in the hot and damp valley of the Rio Paraiba, in Brazil, where cretinism is utterly unknown. The observations of these intelligent travellers confirm the opinion of Saussure, that the only rational cause yet assigned for this singular disease, is the influence of hot and moist air, in narrow valleys, where the form of the mountains around precludes the wholesome agitation of the atmosphere by the winds. Saussure justly rejected the use of snow water as contributing to this disease, because it is unknown among northern nations, who use no other water for a great part of the year; and the subsequent observations of Drs. Spix and Martius show its frequency in a country where snow and ice are wholly unknown. They describe the valley of the Paraiba about Jacarehy, where they found goitres common, as shrouded in mists and vapours, which descend during the night, and are again elevated by the sun in the morning, without the surrounding mountain ridges permitting a free passage to the exhalations; while the habits of the people are filthy, their habitations wretched, their food of the most indigestible kind—raw maze and pork, and the muddy stream of the Paraiba their only water for every culinary purpose. How these, or any other modifications of climate, produce diseases, we cannot state, but must be contented to acknowledge that the climate exercises a powerful influence on the health and vigour of the human frame.

All these peculiarities must be considered by those consulted on—

II. The Sites for Towns and Habitations.—If the medical man be asked to give an opinion on any particular site, let him consider,

1. *The Purity and Hygrometric State of the Air.*—The average proportions of the cognizable ingredients of atmospheric air are,

	Measure.	Weight.
Nitrogen, . . .	77.50	75.55
Oxygen, ...	21.00	23.32
Carbonic acid, .	0.08	0.10
Aqueous vapour,	1.42	1.03

The quantity of oxygen may be ascertained by the eudiometric process of Priestley, by the instruments invented by Volta and by Hope; but this species of research has not led to any important practical results. The quantity of carbonic acid may be abstracted by lime, or by a caustic alkali.

The proportions of the gaseous ingredients are nearly the same every where; but the proportion of aqueous vapour varies greatly, according to the temperature and pressure of the atmosphere. It is the source of clouds, dew, fog, and rain, according to the suddenness of its precipitation. The quantity present in air may be estimated by Leslie's *hygrometer.* The quantity of rain which falls in any place should be ascertained by the *rain-gauge;* and the quickness of evaporation by experiment, or by observations with Leslie's *atmometer.* The quantity of water evaporated in a given time may be ascertained by Luke Howard's *evaporating basin.* The surfaces of the rain-gauge or *ombrometer,* and evaporating basin, should have the same area, accurately produced by a turned metal ring, and the measure graduated, so as each division on it should correspond to $\frac{1}{100}$ inch of rain on the surface of the instrument.

The quantity of rain which falls on our earth may be calculated, at an average, at 30 inches annually over the whole globe; and as the superficies is computed at 196,816,658 square miles, it follows, that the whole quantity of water which falls annually on the earth would amount to 105,616 cubic miles. The number of rainy days should also be noted; for the quantity of rain is not proportional to the number of wet days. In hot climates it rains more seldom, but more falls than in temperate regions. Thus, the mean annual rain in the West Indies averages 120 inches; at Calcutta, it is = 81; at Rome, = 39; at Liverpool, = 32; at Edinburgh, = 24; at Petersburgh, = 16. In any climate, more rain falls in mountainous districts than in plains. Thus, 50 inches fall in Argyleshire, whilst at Glosgow the rain is about = 30; at Elgin, = 24 inches.

The changes in barometric pressure should also be noted. These are extremely small within the tropics, or even in southern Europe, but fluctuate in northern Europe even to one-tenth of the whole column. In our latitudes, the fall of rain is generally announced by a sinking of the barometer, or the diminished pressure of the atmosphere; and the fluctuations of the mercurial column may be here reckoned at 3 inches. The changes in barometric pressure will therefore generally indicate changes in the moisture or dryness of the atmosphere. But it is not so within the tropics; there the barometer is remarkably stationary; and even in the south of Europe, at Gibraltar, I found that the ordinary fluctuations of the barometer very rarely exceeded 0.20 inch, even for several years. Barometrical observations then become of some importance in high latitudes; and the maxima and minima may be obtained by such register barometers as that proposed by Mr. Keith, or the compound barometer described in the article *Physical Geography*, in the seventh edition of the Encyclopædia Britannica.

The force and direction of the winds in any place have considerable influence on climate, and may be investigated by

Adie's anemometer, by Lind's portable wind-gauge, and by my register anemoscope.

Insolation has also more influence on animal life than has been imagined. The effect of solar light in accelerating the development of tadpoles, has been pointed out by Dr. Edwards.* Sir James Wylie, of St. Petersburgh, has noticed the remarkable difference in the Russian barracks in the number of sick on the light and dark side of the buildings.

2. *A supply of Potable Water* is a most essential requisite. It should not be *hard;* it should be free from any peculiar taste or smell; and the nearer its specific gravity approaches 10,002, to distilled water as 10,000 so much the better. The capability of carrying water through pipes, to any station, is important, when a colony is to be founded. Running water of a good quality is also very important; but it should be recollected that stagnant water is not wholesome.

The supply of potable water to Paris is not abundant. That of the Seine cannot be considered as good potable water, though it may serve for various domestic uses. The supply to London is very abundant, but not so pure as could be wished. The soil is not favourable to a supply from springs; and waters obtained from rivers, though soft, are liable to various contaminations. When a large portion of the water of London was derived from the Thames at London Bridge by hydraulic engines, it was contaminated with the overflowings of the sewers of the metropolis. In the Parliamentary Report for 1821, the annual supply to London = 155,381,038 hogsheads of water, supplied by seven companies, whose net revenue was computed at £163,896 a-year. This quantity, if we reckon the inhabitants of the metropolis and Middlesex at 1,500,000 persons, allows annually 103.5 hogsheads for each individual. The water of Edinburgh is also very abundant, and the quality better than that of most great cities. It is collected in a covered reservoir near the Pentland Hills, from several perennial springs, of which the largest is the *Crawley Spring*. The quantity delivered may be estimated 30,810 hogsheads daily, or about 11,246,000 annually. If we reckon the inhabitants of our city and its suburbs, including Leith, at 170,000, it affords annually 65 hogsheads of excellent water for each person, or about 11½ gallons daily. The stupendous embankment at Logan gorge is not for the supply of the city, but as a compensation to the owners of the mills formerly moved by the Crawley Spring.

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* De l'Influence des Agens Physiques sur la Vie, Paris, 1824.

Some cities have vast reservoirs for water. The two finest I have seen are in Spain. That in the Alhambra at Granada, amid the fairy architecture of the Moors, contains 480 tons of water, perpetually renewed, through earthenware pipes, which conduct the pure waters of the Sierra Nevada into this celebrated reservoir, whence the palace, with its hundred marble fountains, and the city, are supplied. The other is the vast tank constructed by our Government at Gibraltar for the supply of the British fleets. It consists of five vaulted cisterns, of such stupendous size, that each perpendicular foot of this tank is equivalent to 1000 tuns of water. It contained, at the period of my visit, about 9000 or 10,000 tuns of very limpid water, collected by covered channels on the mountain above the town, and so placed that line-of-battle ships can be watered by means of leathern hose in a surprisingly short space of time.

Natural waters always contain more or less saline ingredients dissolved in them. The purest natural spring-water may contain about $\frac{1}{6400}$th of their weight of earthy and alkaline salts, which are chiefly as follows, and may be thus deected:

1. Carbonate of Lime, ...	by Oxalate of Ammonia.
2. Hydrochlorate of Soda,	by Nitrate of Silver.
3. . . . . of Lime,	
4. Sulphate of Potassa,	by Nitrate of Baryta.
5. . . . . . . of Lime,	
6. Carbonate of Soda,	by Evaporation and Hydrochlorate of Lime.

Water containing about $\frac{1}{3000}$th of its weight of these ingredients becomes *hard*, and is neither so suitable for boiling food, nor for washing, as *soft* water.

Water, when kept long in casks, is apt to become fetid. The best preventive is either to char the inside of the cask, previously, or to introduce a piece of wood-charcoal into each.

On long voyages, it is advantageous to have some simple distillatory apparatus around the sides of the fire used for cooking the men's food. In this way, a considerable addition of sweet water may be daily obtained from sea-water, without any additional expense of fuel; and all that is necessary to render it equal to the finest natural water, is to agitate it in a vessel half-filled with atmospheric air, that it may regain any air which it has lost by distillation.

3. *Fuel* is another essential requisite, both for cooking and for warmth. A plentiful supply of wood, coal, or peat, is indispensable where many human beings are to be congregated. Open fire-places are cheerful, but not economical modes of warming apartments; stoves are more frugal; hot-air flues combine ventilation with warmth, but require considerable attention in their management; steam-tubes convey an equable temperature, but are less convenient than the circulation of hot water in the apparatus devised by Mr. Perkins.

Pit-coal is the cheapest and least bulky fuel; wood the most agreeable; good peat a very cheerful and valuable fuel, in countries deficient in the other kinds. The method of rendering fresh-dug peat immediately combustable by forcible compression, is a valuable discovery, which may become of vast importance in various countries, where other fuel is scarce, and the climate rainy.*

4. *Vicinity of Trees* is an important circumstance; but it

* [Where stoves are used, it is important that a vessel of water should be placed upon them, to prevent the inconvenience that is suffered from breathing too dry an air. This is especially necessary in regard to the stoves for anthracite coal, much employed in certain states of the union.]

must not be forgotten, that a station buried in deep forests is seldom wholesome, and in hot climates is often pestilential. In some countries they are dangerous from the shelter they afford to beasts of prey, and often very disagreeable from the clouds of blood-sucking insects with which they are infested. Even the lower animals participate with man in the plague of flies. The wild deer of North America are annually driven from the close woods of that continent by musquitoes, and pass on the ice to browse on the open plains on the Asiatic side of Behring's Straits, and repass again to the winter shelter of their native woods, when their winged tormentors are no more.

The impolitic destruction of timber in some countries with a soil naturally saline, has doomed whole regions to barrenness, by depriving the herbage of the supply of moisture, which trees are well known to condense from the air. This has converted wide tracts in Spain, and still more in Persia, into arid wastes of hopeless sterility.

5. *Vicinity of Hills and Mountains* is also deserving of consideration. If they be very lofty, in hot climates, the plains at their feet are often pestilential, producing *black vomit* and *jungle fever;* yet removal to the mountains immediately relieves the sufferer, as is witnessed in the ascent from Vera Cruz to Xalapa, and from southern Hindustan to the Neilgherries.

When the mountains rise to the region of perennial snow, they often cool the valleys at their feet, by the perpetual descent of currents of dense air to supply the place of that raised by the heat in the valleys. Thus the valleys on the Italian side of the Alps enjoy a delightful summer temperature from this circumstance; and the intense heat of a Spanish summer is mitigated in the plain of Granada, and the coasts of that province, by the cool air rolling down from the vast perennial wreaths of snow that crown the rugged summits of the *Sierra Nevada.*

6. *Vicinity of Rivers or Streams.*—From the multifarious uses to which running water is applicable, a supply of it is de-

sirable near human residences. It is true that, in tropical regions, or even in the warmer parts of Europe, the banks of a river are not always healthy. This chiefly arises when the streams are sluggish, and much impregnated with decaying organic matter, or where the rivers are subject to inundations. Such rivers are often sources of surprising fertility; but the country is liable to intermittents. When a river has a free current, high banks, and flows over a gravelly or rocky bottom, it is, however, a desirable neighbour. The mouths of navigable rivers, though politically important stations are frequently unhealthy; as is too well seen in the mouths of the rivers on the western coasts of Africa, and in most of those of the hotter parts of America.

7. *Vicinity of Marshes,* in every country, is to be avoided, in fixing on a site for human habitations. Marshes produce malignant remittents in hot seasons, and give rise to severe hepatic disease. The marsh fevers of Walcheren, and the *malaria* of Italy, originate in stagnant water; and the fatality of some of our stations in the West and East Indies is to be attributed to swamps. Some of them, as British Guiana, have become more healthy as the country is more drained and cultivated.*

The *Maremma* of Italy is pestilential from its marshes, which extend along the coast from Livorno to Terracina, a distance of 200 miles, with few interruptions, and reach back to the bases of the Appennines, in a varying breadth from ten to forty miles. In all this tract *malaria* abounds, especially during July and August; and a visit to the Maremma before the first rains in September is sure to be followed by an attack of intermittent fever. The best known of these marshes are those around Volterra, in the Tuscan Maremma, and the Pomtine Marshes in the Roman States. The soil of these regions in some places appears dry; yet even in these malaria is found. But, in general, the freshness of the verdure shows that water is percolating near the surface, through a thin covering of volcanic materials; and broken aqueducts, and ruined fountains, in the remains of ancient magnificence, are there pouring out their now worse than useless waters, to render the vicinity pestilential. Brocchi, and several other writers, attribute the deadly influence of the malaria on the poor peasantry of the Roman Campagna to their defective clothing, and their want of fit shelter against the cold night winds, after the toil of a sultry day. The neglect of cultivation has widely extended this pestilential atmosphere in that ill-fated country; and there is not one of the seven hills of the ancient mistress of the world now quite free from this desolating scourge. In the hot months, to linger without the walls during the night, or in the deserted space within them, is death; and, unless some unforeseen event shall redeem that country from a decayed and rickety system of misgovernment, the period seems not far distant when Rome will be as desolate, from this cause, as Pæstum or Volterra. If Italy be destined to escape from her present political degradation, and to be united in one or two firm and equitable governments,—the repairing of broken aqueducts—the clearing of choked-up water-courses—the draining of marshes—the raising of embankments to confine rivers in one channel—and the encouragement of agriculture—will, without doubt, check the malignity of the malaria disease, and restore this fairest portion of Europe to salubrity and prosperity.*

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* [This is doubtless true, as a general principle, but marshes are not unhealthy unless the region is malarious, and malaria is unquestionably disengaged, and at times in fearful force, where there is not the slightest evidence of exposed or subterraneous water.]

8. *Vicinity of the Sea* is always an important element in choosing a station. In hot climates, the sea-breeze mitigates the heat of day, and renders it endurable. This breeze is very regular in summer, even at Gibraltar. The vicinity of the sea

* See Brocchi, "Sul Stato Fisico della Suolo di Roma, 1820."—Micara, "Della Campagna Romana, et del suo Ristoramento, 1827."—"Lettres écrites d'Italie en 1812 et 1813, par Chateauvieux."—"Forsyth's Travels, 1801."—Bonstellen. [See the remarks on this subject, and on terrestrial emanations in general, in Dunglison's Elements of Hygiène, p. 94. Philad. 1835.]

also mitigates the cold of winter. Sometimes it renders a station unhealthy, when the recession of the tide exposes a great extent of muddy beach. This is especially the case at the mouths of great rivers: yet such stations though unwholesome, are often politically important as naval stations, or as keys to the back-country. Marshes, into which sea-water occasionally enters, are observed to be more pestilential than mere fresh-water swamps. A striking instance of this is given in the memoir of Gaetano Giornini.* A Luccesan engineer, about the middle of the last century, adapted floodgates to the streams in the *Littorale* of Lucca, which, by opening only outwards, allowed the land waters to descend, but prevented the sea, when driven by the west wind, to enter and mingle with the swamps. The Littorale became healthy, and its population increased from 1500 to 9408; marsh-fever disappeared, except on two occasions since, when, by the worming of the gates, sea-water was insensibly admitted; and, on both occasions, marsh-fever raised its head, until arrested by the repair of this valuable contrivance. The town of *Viareggio*, with 2000 inhabitants, stands in what was before an uninhabited salt-marsh; and the mortality in that district, which, before the labours of the engineer, even with the system of annual migration during the hot months = 1 in 15, is now only 1 in 40,—about the average mortality over Europe.

III. DRAINS AND SEWERS are important public works, on the proper construction of which the salubrity of a station may greatly depend. They should have such a fall as to carry off impurities, and to prevent an accumulation of stagnant water. The Greeks and Romans excelled in their attention to such works; but the unhealthiness of many places in Italy, in the present day, is owing to the neglect of those useful structures. The remains of the *cloaca maxima* at Rome, which astonished Pliny by its duration since the time of the elder Tarquin, still remains to test the truth of Pliny's panegyric: "Operum omnium maximum, suffossis montibus, at queurbe pensili, subterque navigata." Modern sewers are far less magnificent, and are frequently so narrow, as to be liable to be choked with mud and silt. Those of London and Edinburgh appear to be well constructed. It would be desirable that there were means in all great cities of occasionally washing them out, by turning streams of water into their channels; as M. Agrippa did into those of Rome.

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* Mém. del' Institut Royal, 1825.

IV. Paving of Streets, and Care of Public Ways, are objects also worthy of the attention of the medical man, though chiefly in the province of the civil engineer. The chief circumstance in the paving of towns in which medical police is concerned, is a mode of obviating the injury to the eyes of the inhabitants, from the common method of leaving too much of the sand used for bedding the stones in the pavements of the streets on the surface, to be tossed about by the winds. *Macadamized* roads and streets are exceedingly dusty in dry weather, and are covered with mud in the wet season. The substitution of wooden blocks, set on end, makes, it is said, a very firm, smooth road; but the little noise occasioned by the approach of carriages renders the *crossings*, in crowded streets, hazardous to foot-passangers. The flagged foot-paths of London, Edinburgh, and most of our other large towns, are very perfect.

V. Cemeteries.—Little attention has, in this part of Europe, been bestowed on the police of repositories for the dead. Burial in church-yards, in the midst of a crowded population, and even within churches, is still suffered to disgrace our cities. The French have set a good example; and the Turks have long been noted for the decent propriety and judicious position of their cemeteries, which are always beyond their towns. Several American cemeteries are worthy of commendation. That at Newhaven, in Connecticut, has been eloquently described by Dr. Dwight; and there is a very splendid one lately laid out at

Mount Auburn, in the vicinity of Boston. It was commenced about 1833.*

Burial in towns and cities is now prohibited in Denmark, Austria, Bohemia, Venice, and has been so in France since 1776. The same is the practice of the Chinese, and of many nations whom we call barbarous. In Madagascar, the bodies of persons of note are buried in living trees. An enormous teak is selected, a sort of door formed, a cavity scooped out, in which the body is placed erect, and the aperture is closed up with wood, cemented to the opening. In Hayti, all the funerals are without the towns; and the same practice prevails among many African tribes.

A better system is commencing among us, in the new cemeteries of Glasgow, Liverpool, Newcastle, and a few other places; and it is fervently to be hoped that, ere long, our towns will cease to be infected with putrid emanations from crowded church-yards, and the temples of God to be polluted with the frail remains of mortality. The cemeteries of London are a disgrace to the metropolis. They are rather better in Edinburgh; but here the cemeteries ought to have been removed altogether beyond the city; and the retired valley between Salisbury Craigs and Arthur's Seat offers an admirable site for a spacious and magnificent necropolis. The best mode of sepulture is probably in the earth, without vaults; but any thing is preferable to the horrid practice in Rome, of disposing of the carcasses of the poor in huge caverns, often opening into the very churches. Into these the bodies of the poor are tumbled naked—all ages and sexes mingled in one foul mass of corrupting sanies. The stench on opening these vaults is most loathsome. Lyman computes the numbers annually thus disposed of in Rome at 3000.* The higher ranks are buried in vaults in the churches. There are no less than 171 churches in Rome in which funerals are permitted; and in those most used, the funeral-service is often omitted on account of the stench.

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* [Philadelphia has her three cemeteries,—two at a distance from the city,—one of which, Laurel Hill, commenced a few years ago, far as its extent permits, as, is equal, perhaps, to any one elsewhere in beauty, and adaptation to its hallowed purpose.]

Much information on this subject may be got from the essay of Piattoli,† which was long ago translated into French by Vicq d'Azyr, who added to it a curious appendix.‡

Sir Christopher Wren was a strenuous advocate for preventing burials within cities, and wished to have a general cemetery for London in the outskirts of the town; and the same opinion was advocated by Evelyn about the same period.

VI. Hospitals.—The erection of hospitals is intimately connected with the subject of medical police. We cannot enter on a consideration of each sort of hospital, but state in general terms, that the wards should be lofty, with windows on one side, and galleries on the other for exercise to convalescents. Ventilation should be secured by some of the means already indicated; the wards should be provided with privies and baths, appropriated to each; the bed-steads should be of iron, as less liable to harbour vermin; airing-grounds and convalescent-rooms should be attached to all hospitals. In a lunatic asylum, each class of patients should have separate airing-grounds; and occupations suited to their cases should be provided for convalescents. Foundling-hospitals, from the mortality in them, even under the best management, seem to be amongst the most pestilential institutions of mistaken benevolence.

The enormous mortality in the foundling-hospitals of Vienna, Moscow, Berlin, Paris, Dublin, &c. is perfectly appalling. At the former place, the returns of 1810 show, that out of 2789 infants received, 2583 died within the year. In the hospital of Moscow, during twenty years, 37,607 infants were received, of whom 36,587 perished, or 1020 alone were sent out. In the Berlin hospital, three-fourths of the number received died within the month. Cross, in his Medical Sketches of Paris, states that $\frac{11}{13}$ of all the infants received into the Parisian foundling-hospital perish in the first year. The statements of Sir John Blacquier showed that of 19,420 infants received, during ten years, into the Dublin Hospital for Foundlings, 17,440 had perished; and that, of 2180 received there in 1790, there were only 187 alive at the beginning of 1791. In the Parliamentary investigation which took place in consequence, it was proved that, in nineteen days, 116 were received, of whom 112 died. Such considerations induced a German author to propose as an appropriate inscription over the gates of such establishments, "Children murdered here at the public expense."

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* Letter to Dr. Hosack in "Report on the subject of Interment." New York, 1825.

† On the Danger of Interments in Cities.

‡ See also "Rees's Cyclopædia, *Interment*," and "Dictionnaire des Sciences Médicales, art. *Inhumation*."

Hospitals for the sick, military hospitals, and barracks, all may fall under medical police. The general principles applicable to them all are the same as in all other congregations of many human beings,—ventilation, cleanliness, and an abundant supply of fuel and of good water, are indispensable. The form of the building is important. The St. Andrew's cross, or the form of **H**, is convenient, as allowing of additions, without spoiling the interior arrangements. The square form of an ordinary house, or of a hollow square, may do for a small hospital, but is not well adapted for a large building, as it is more difficult to command ventilation. Every hospital should be provided with spacious airing-grounds for convalescents, who should, if possible, eat and sleep in a different part of the establishment from those confined to bed.

The modes of heating and ventilating introduced by Dr. Murray and Mr. Sylvester, may be advantageously introduced into most hospitals, and secure both warmth and ventilation.

VII. Schools.—Seminaries for the instruction of youth merit more attention from the Legislature than they have received.

The rooms are often defective in ventilation; and the modes of warming them in cold weather are often very inefficient. In some schools too little attention is paid to vary the diet of children; and although seldom deficient in quantity at large public and private schools, there often exists inattention to render it palatable, or to suit it to peculiarities of constitution. In many schools the hours of study, for very young children, are too long. The degrading practice of public flogging, even almost to manhood, in some schools, is brutalizing to the inflictor, and destructive of the delicate sensibilities of ingenuous youth. We must also stamp with our strongest disapprobation the practice of *fagging*, which prevails at some English schools, and is calculated to foster the vices of both tyrants and slaves. In female seminaries, the lessons are generally too long, the pupils too sedentary, too little in the open air; and many female *accomplishments*, as they are termed, are apt to produce lateral curvature of the spine, as was fully proved by the late Mr. Shaw. In his admirable work on Distortions of the Spine, he has shown how a faulty position in bed, in harp-playing, and in writing, tend to produce lateral curvature in young females. I have, in a great number of instances, employed most of the ingenious contrivances of Mr. Shaw in this disease, as well as Dr. Grant's method of balancing a moderate weight on the head, the plan of exercising the muscles of the spine in picking up light objects from the ground, and some of *Portal's* devices for the cure of the curvature of the spine, with very excellent effects.*

VIII. Prisons.—The state of our prisons is much improved since the time of Howard. The disappearance of jail fever from among us is one of the good fruits of attention to the state of our prisons. The dreadfully filthy state of the prisoners brought to trial at Cambridge, in 1522; at the black assizes in Oxford, in 1577; at Exeter, in 1586; at Ilchester, in 1730; at Taunton, in

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* See "Lectures on the Structure of the Skeleton," &c. by James Wilson, "On the Nature and Treatment of Distortions of the Spine," by John Shaw. Lond. 1823. Portal, "Sur la Nature du Rachitisme."

1742; at Newgate, in London, in 1750; and, finally, at Dublin, in 1776, was the cause of vast mortality among numbers who attended the courts on those occasions, including judges, counsel, and spectators. The want of due ventilation appears to have been the principal source of those calamities: but the vigilance of all parties is now aroused, and the exposures in the last century of the shameful mismanagement of the Fleet Prison, of Cold-bath-fields and Ilchester jails, have produced very salutary effects. The principal improvements are in the county prisons of England; in many of which much attention is paid to preserving the health of prisoners, by clean rooms, commodious airing-grounds, and humane regard to their diet and the cleanliness of their persons. In most of the prisons of this country, however, much is still defective, in what relates to the classification of prisoners, and separating juvenile delinquents from hardened offenders. In the county jails of Lancashire and Cheshire, much has been done to render prisons what they ought to be; but even in some of the best English prisons, there are still no hospitals for the sick inmates; and the jails of Scotland are far behind those of the two counties alluded to in every respect. As far as lodging and diet go, there is no room for improvement in many British jails; and this humane attention is rewarded by the disappearance of jail fever from our island. The subject of prison discipline is a wide field. The benevolent exertions of Mrs. Fry and her Quaker associates, prove that much good would flow from attention to the instruction and moral improvement of the unhappy inmates of our prisons.

IX. Lazzarettos and Quarantine Establishments are of Italian origin, at the period when the commerce of the East was engrossed by the free cities of Italy. The doctrine of contagion is not of modern origin, as has been ignorantly alleged. The plague, in ancient times as at present, was imported from the East into Europe. There is some doubt respecting the nature of the pestilences which in remote ages afflicted Europe, from the scanty notices of them by historians. There is even some doubt whether the terrible disease which devastated Attica, in the time of Pericles, which has been forcibly described by Thucydides,* was the true plague; but a disease resembling the plague prevailed in Italy in the reign of Titus, about the 80th year of our era; and again in the year of Christ 167, in the age of Marcus Aurelius. The plague appears to have reached Britain in the first century, and to have greatly depopulated the Roman province, just after a terrible inroad of the *Piks* and *Scots*. The plague seems to have several times visited western Europe in the middle ages, especially when religious fanaticism and commerce made its inhabitants familiar with the East. The most terrible visitation of this kind was that plague which spread in Europe about the middle of the fourteenth century. It began in China in 1333, after that country had been violently shaken by earthquakes, and in the course of sixteen or seventeen years, extended itself into every part of Europe. It penetrated into France in 1349, and into Dorsetshire in the same year, whence it was speedily introduced into Scotland and Ireland. The disease is said to have swept off one-fourth of the whole inhabitants of Europe. In Scotland it again appeared in 1361, and carried off one-third of her population. Since that time, as our commerce with the East increased, the plague frequently visited these islands; but, since the plague of London, 1664—65, we have been wholly exempted from this terrible scourge. At that period, our quarantine laws began; and though the plague appeared at Marseilles in 1720, at Malta in 1813, and at Noya on the coast of Naples, in 1817, Britain has enjoyed a total immunity from pestilence.

Though the contagious nature of plague is generally admitted, it is certain that the space of its operation is limited. If absolute contact with the sick, or with articles which have touched his person, be avoided, there is little risk of being infected.

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* Lib. ii.

The assistant-surgeons in the pest-houses of Moscow, when the disease was last in that country, took the disease, but not one of the physicians; the former were necessarily brought into contact with the sick; the latter freely visited them, but avoided contact. The French and English officers, in the armies of the East, visited the pest hospitals with immunity from the disease, if they did not touch the sick.* Notwithstanding the clamour of interested individuals a few years ago, no rational medical man denies the contagious nature of the plague; and we have no doubt that the immunity of this island from that dreadful scourge for 170 years, notwithstanding our multiplied relations with the East, is mainly owing to the rigour with which the quarantine laws have been enforced. Some of these regulations may err on the side of excess of caution; but this is far preferable to rash experiments, prompted by crude medical speculations, and supported, as they were attempted to be, by distortion of facts. The quarantine laws were revised in 1825, and the code is now, upon the whole, good. The quarantine stations for Britain are Sandgate-creek, Deal, Milford-haven, Liverpool, Holyloch in the Clyde, and Inverkeithing Bay in the Forth.

The spasmodic or Asiatic cholera, which was a very fatal epidemic in Europe in 1831 and 1832, appeared first in some of our seaports, and thence spread to most parts of the British Isles. It began to be noticed as a very fatal epidemic at Jessore, between the mouths of the Ganges and the Bhurampootra, about 1817. Thence it was diffused over India, the Indian Archipelago, and China. It followed the routes of the great caravans across central Asia, by Cabul, to Russia; while, at the same time, it passed from Bombay, by the Persian Gulf, to the shores of that sea, and followed the great lines of human communication by Schirauz, Ispahan, and Tabritz, to Astrakhan, and thence to Moscow and Warsaw; and by another caravan route it passed to Bagdad and Diarbekir, to Antioch and Damascus. From these points in Asia Minor and in Russia it was speedily diffused over Europe, and in 1831 it reached our own shores. It at length visited North America; where it first appeared at different seaports in direct communication with Liverpool, London, and Ireland, where the cholera then raged. This constant march of the disease along the great routes of human communication, across every variety of soil and climate, along rivers, and across arid deserts, more especially the mode of its diffusion in America from the ports in direct communication with Europe, appears to me very difficult of explanation, except we admit its propagation by contagion.

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* See Prosper Alpinus, "De Medicinâ Egyptiorum." Diemerbroek, "De Peste." Mead "On the Plague." Dr. P. Russell "On the Plague." Besides the treatises of Pagnet, Desgenettes, and Frank, of Calvert, Tully, and Faulkner, on that of Malta. Despatches of Sir Thomas Maitland.

The destruction of mankind by this malignant cholera has had no parallel since the *Black death* or plague of 1348. Between 1817 and 1830, it was computed to have destroyed in India 18,000,000 of persons; in other parts of Asia, in Russia, and in Poland, it was estimated in that period to have cut off 50,000,000;* besides its numerous victims since that time in western Europe and in America.

X. Punishments.—This subject, the last of the present outline, is worthy of the attention of the legislator and of the medical jurist.

1. *Corporal Punishments*, inflicted by sentence of our courts, extend to imprisonment, whipping, and forced labour.

Imprisonment is adjudged for several offences, and even for inability to pay a debt. When the health of a prisoner might suffer from confinement in a damp or unwholesome jail, the humanity of judges has frequently mitigated the severity of the sentence, on the representations of medical witnesses. It would be unjust to inflict a greater punishment than the law contemplated by the mode of confinement; but in general our jails are far more comfortable, as far as lodging and diet are concerned, than the usual habitations of the very poor; and therefore imprisonment, in some instances, may have lost some of its salutary terrors in preventing crime.

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* Rapport de Moreau de Jonnés. Par. 1831.

Whipping is sometimes inflicted by sentence of the court, either publicly or privately; it is now generally applied to juvenile offenders in prison, and is far less frequently inflicted in public than formerly, especially since the abolition of the pillory for ordinary crimes. Flogging is still permitted to a limited extent both in our army and navy. A medical man is always present on such occasions; and should he declare the punishment *enough*, even one lash more, at that time inflicted, is a crime, and would subject the officer who ordered it to indictment for murder, should the sufferer die. *Hard labour* is now generally inflicted by the *treadmill*,—a contrivance by which the united weight of the prisoners condemned to it puts in motion a wheel, which moves machinery. The defect of this punishment is its inequality. To active persons, accustomed to walking, it is a light exercise; but to sedentary persons it is a most grievous punishment, giving intolerable pain to the muscles of the legs and the spine. To the disgrace of our country, it has been inflicted on females. Their muscles are too weak, and their habits little inured to such labour; and it is liable to induce miscarriage, if the prisoner be pregnant, and *prolapsus uteri*, or other serious diseases of the female system, in various ailments of the sex. It arms, too, with a dangerous and tyrannical power, ignorant justices and unfeeling magistrates. The law should forbid this infliction on females in all cases, and prevent the erection of treadmills in all prisons not liable to the legal inspection of grand juries; which, it seems, *houses of correction* in England are not, they being "not under the jurisdiction of the sheriff of a county." In the valuable work of J. A. Borgnis,* there is a passage which proves how severe a similar exercise is on men condemned to it. At the siege of Venice in 1813, the French governor ordered M. Borgnis to prepare eight mills, to which movement was to be given by convicts, in what is termed *Roue à Tambour;* that is, by causing them to march within the wheel, instead of on the floats round its periphery. None of these unfortunates were able to continue at this work above three days; although they wrought only six hours in the day, with each alternate hour one of rest, and alhough they had a large allowance of food, and a sufficient quantity of wine. The majority of them, though before vigorous, became ill after the third day, and all testified the utmost abhorrence of this species of punishment.

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* "Traité complet de Mecanique appliquée aux Arts," in the part which treats of Mouvemens des Fardeaux.

The beating of hemp was formerly with us the infliction for petty crimes; and in Holland it was rasping of dye-woods in the *Rasphaus* which was always considered as a severe punishment. In America, the penitentiary system of forced labour has been tried, and is still a subject of discussion. Solitary confinement has also been employed there; which some have considered worse than death.

2. *Capital punishments.*—In this country, excepting in cases of nobles for treason, *hanging* is invariably the mode employed by law. This is with justice preferred to any other mode of public execution, as the evidence of those who have recovered after suspension renders it probable that the person suffers very little pain, from his becoming speedily insensible; and when the *drop* is employed, the injury to the neck seems generally to extinguish life instantaneously.

Beheading is in this country performed with the axe; in Germany, with the sword, and in France with the guillotine; the prototype of which seems to be the Scottish *maiden,* still to be seen in the Antiquarian Society's Museum, in Edinburgh.

The axe often requires a repetition of the blow; and the sword is liable to the same objection. The maiden chopped off the head by the descent of an axe loaded with lead. The guillotine slices it off, entering one side of the neck by an oblique edge. All sorts of beheading present a very ghastly spectacle, and habituate to the sight of human blood; besides which, serious doubts have been started as to the possibility of the head for a short time retaining its sensibility.*

3. *Pleas in bar of execution.*—When a person is condemned to die, execution of the sentence may be deferred on three pleas.

Insanity may be pleaded by the relatives of the condemned, and a jury may be appointed to try the sanity or insanity of the prisoner.

The *youth* of the party is the second. There is no age fixed by British law, at which the perpetrator may not be executed for heinous crimes. In 1629, a child between eight and nine years of age was executed in England for an atrocious murder; one of ten years was condemned in 1748, at York; and a boy of thirteen was executed in this city, within the present century, for a murder. Blackstone states the lowest degree of non-age, by the practice of the English courts, to be seven years.

Pregnancy is the last plea admitted in our courts. When this is alleged, a jury of matrons is appointed by the judge to inspect the party, and if the allegation be found true, she is respited till after delivery. These persons are very incompetent to so delicate a task. It should be entrusted to accoucheurs, who, from the appearance of the mammæ, the application of the stethoscope to the abdomen in the latter months, [and the other signs mentioned elsewhere,] will readily ascertain the truth or falsehood of the allegation.†

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* [Death must of course follow almost instantaneously from loss of blood, but there is doubtless an appreciable space of time, during which the head may continue to feel, or in other words, during which the external senses may continue to act. Recent observations, however, by Bischoff, Heerman, and Jolly on a robber who was beheaded by the sword induced them to infer, that consciousness must have ceased instantaneously.—Bischoff, in Müler's Archiv. and S. L. L. Bigger, in the Dublin Journal of Medical Science, Sep. 1839.]

† [The following recent enactment in the state of New York, intended to take the place of the common law, is cited by Dr. Beck.—Med. Jurisprud. 6th edit.

i. 177, Philad. 1838.—"If a female convict, sentenced to the punishment of death, be pregnant, the sheriff shall summon a jury of six physicians, and shall give notice to the district attorney, who shall have power to subpœna witnesses. If, on such investigation, it shall appear that the female is quick with child, the sheriff shall suspend the execution, and transmit the investigation to the governor; whenever the governor is satisfied that she is no longer quick with child, he shall issue his warrant for execution, or commute it, by imprisonment for life in the state prison."]

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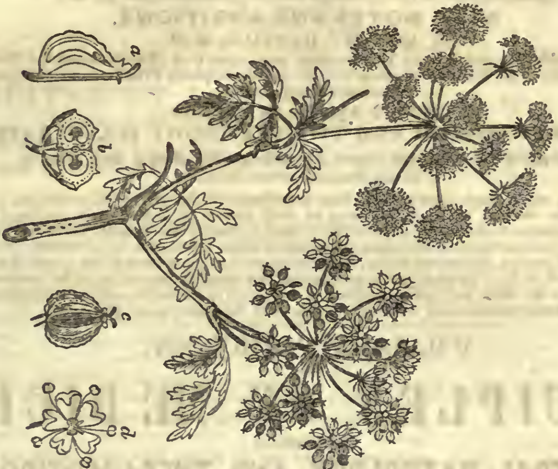

Fig. 72.

CONIUM MACULATUM.
(Hemlock.)

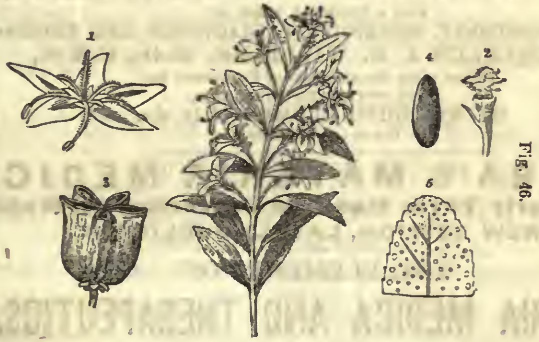

Fig. 46.

DIOSMA CRENATA.
(Rue.)

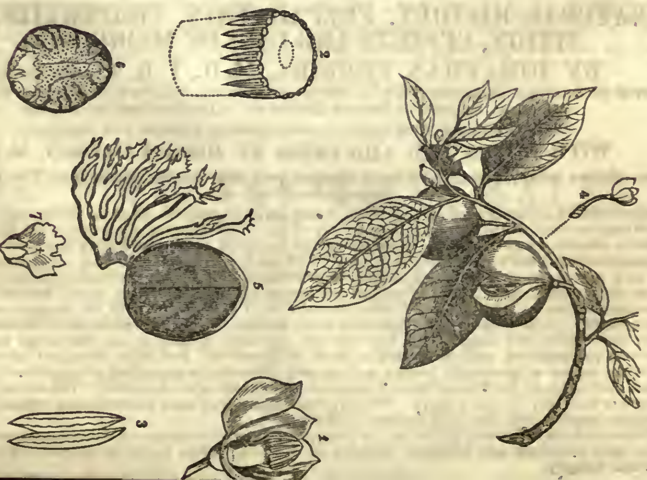

Fig 85.

MYRISTICA OFFICINALIS.
(Nutmeg.)

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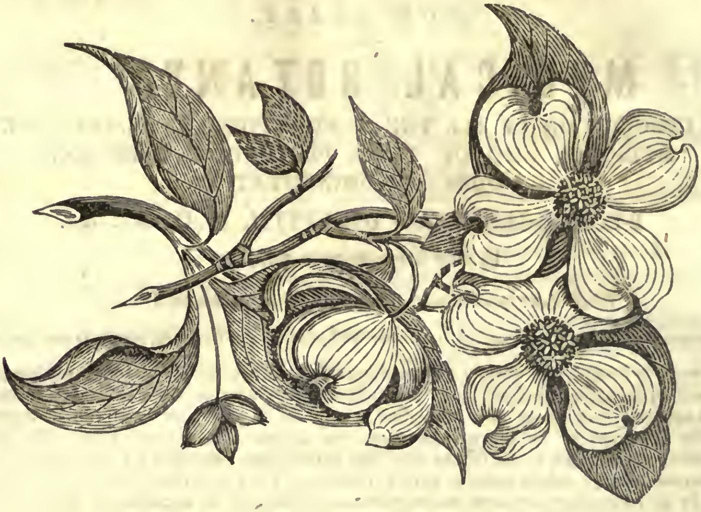


Fig. 164.

CORNUS FLORIDA.
(Dogwood.)

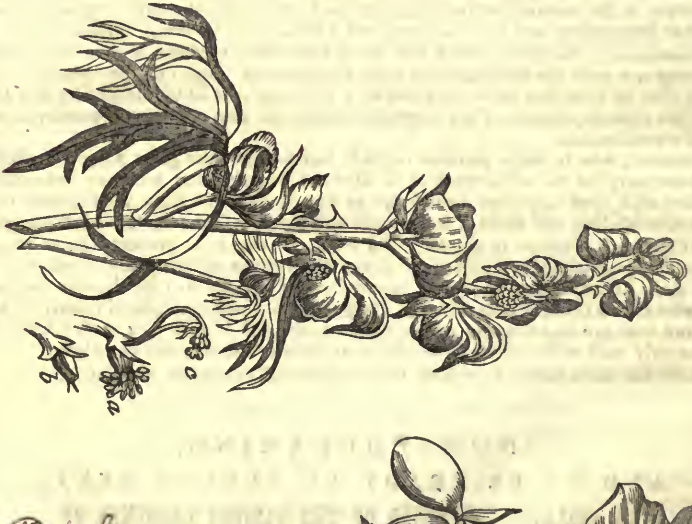
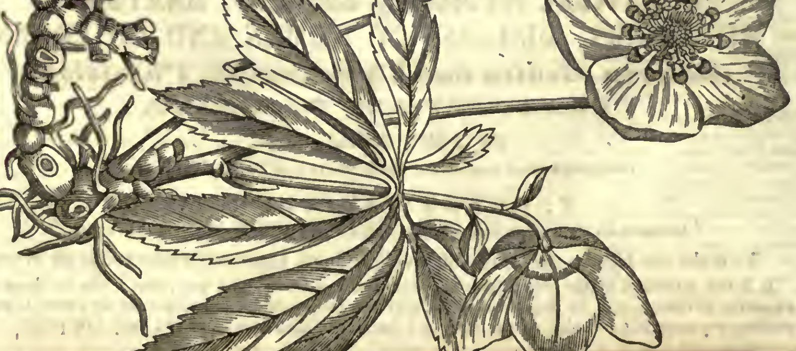


Fig 54.

ACONITUM NAPELLUS.
(Wolfsbane.)



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ow long Does it take to kill one's self by
rvation?—The resolution that is suppo-
to have been formed by Morey, the ac-
plice of Fieschi, of starving himself to
th, is not the first example of the kind on
ord. The same mode of suicide has, on
eral former occasions, been successfully
pted by accused and condemned persons.
as been remarked, that the horrible tor-
es of hunger do not produce delirium,
even annihilation of the intellectual fa-
ties, except when violently imposed upon
a power superior to that of the victim.
e suffering, on the contrary, when incurred
the purpose of suicide, and endured with
ergic but fatal determination, seems to
cite and invigorate the moral faculties, and
increase their acuteness. In spite of the
haustion and prostration of the physical
ganization, the immaterial portion of the
stem acquires new strength, and contains
inconceivable developement of pow-
r.

A very curious example of suicide by
eans of starvation occurred so
go in Corsica. During the ele
ieur V——— rushed into the el
ege armed with a dagger, which
d into the breast of a man who
im some injury. The man fell
eet. The assasination was co
he full light of day, and in the
of an assembled multitude. Ne
act of an Italian *vendetta* more s
cuted.

V——— was tried, found guilt
demned to death. His high spi
luto character were well known
suspected that he would seek, by
death, to evade the disgrace of
the scaffold. He was, therefo
watched; and every precaution
prive him of the means of putti
his existence.

He resolved to starve hims
during the interval which elaps
the sentence of the Court of
the reply which the Court
would make to the appeal he
it.

He had succeeded in conceal
observation of his jailers a p
food with which they supplied
to make it believed that he r
his meals. After three days a
pain of hunger became insup
then occurred to him that he m
speedily accomplish the obje
view, by eating with avidity.
that the state of exhaustion to
reduced would unfit him to be
excess. and that it would inevi
the death he so ardently desi
cordingly sat down to the food
riven so fatal gratification from

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